

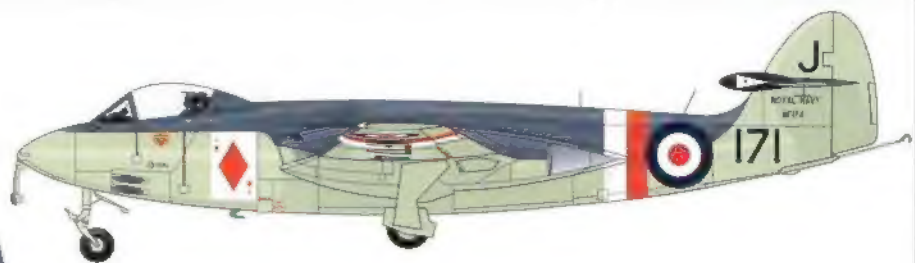
WARPAINT No. 29

Hawker **SEA HAWK**

BY TONY BUTTLER AIRMAIL

An attractive view over England's south coast of the Fleet Air Arm Historic Flight's restored Sea Hawk FGA.4 WV908. This aircraft did in fact fly with 806 'Ace of Diamonds' Squadron, carrying the same distinctive emblem and with the same code '188', between July 1959 and August 1960.



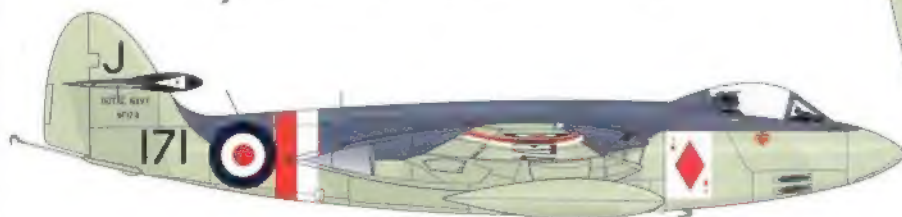


Hawker Sea Hawk F.1

WF174:171-J of 806 'Ace of Diamonds' Squadron Fleet Air Arm, shore-based at RNAS Ford in October 1953. The red and white bands on the wings and fuselage were for exercise identification purposes



Drawings by David Howley





Hawker SEA HAWK

By Tony Buttler MRAeS

After the end of World War 2 the Fleet Air Arm (FAA) was a little behind the RAF in getting itself fully equipped with jet fighters. The first to enter service, Supermarine's Attacker in 1951, was not in the highest class as a combat aircraft but proved a good gap filler and provided important experience in jet operations. The second FAA jet fighter, the elegant Hawker Sea Hawk, was an altogether better machine.

HAWKER'S FIRST JET

Surprisingly, despite being a major fighter manufacturer, Hawker was beaten by three other British firms in the design and production of jet fighters, the Attacker coming third after Gloster's Meteor and de Havilland's Vampire. Hawker's first jet powered design was the P.1011 project of 1941 which was an exercise in fitting Power Jets units into the P.1004 high altitude fighter. The origins of the Sea Hawk begin with the P.1035 of 1944 which was described as an F.2/43 Fury with a Rolls-Royce B.41 engine installed in the centre fuselage; the piston Fury's elliptical

Hawker P.1040 VP401 seen on an early test flight. Note the original bulbous canopy, the forward part of which was later replaced by a framed flat screen to eliminate distortion. VP401 was essentially an aerodynamic test aircraft. (BAE Systems)

wings were retained but the project featured air intakes in the wing and a split exhaust pipe.

Early in November 1944 the Director of Operational Requirements, Mr Wardle, and the Director of Technical Development, N.E. Rowe, visited Claremont House in Esher to discuss jet aircraft; Claremont was the wartime base for those Hawker staff involved in the design of new aeroplanes. The use of a single unit was suggested and within a few days Rowe supplied the particulars of a 6,000lb (26.7kN) Rolls-Royce unit. Soon afterwards Hawker sent Rolls details of a bifurcated pipe scheme for investigation. On 22 December a single seat fighter aircraft with bifurcated (split) jet

A classic view of a high-finned German Navy Sea Hawk Mk.101 fitted with underwing tanks and in the standard colour and markings scheme for aircraft of this type.

pipes and Rolls Royce B.41 Nene engine was drawn under the designation P.1040. This was a cleaned-up P.1035 with straight tapered wings and virtually nothing of the Fury remained although an earlier drawing did feature the same fuselage coupled with the Fury's elliptical outer wing panels.

The Nene was the famous engine maker's first 'all-new' jet engine designed from scratch on a 'clean sheet of paper' but incorporating so much of the knowledge and experience gained from working on Frank Whittle's engines. It first ran on the bench





VP401 after the original rectangular heat shield fairings had been replaced by the pen nib form which appeared on all Sea Hawks. The picture was taken by Hawker photographer Cyril Peckham and 'Wimpy' Wade is in the cockpit. The short nose is striking (the Sea Hawk's was a touch longer) and the space ahead of the cockpit housed the nosewheel. (Eric Morgan)

on 27 October 1944 and the next day reached 5,000lb (22.2kN) thrust making it the most powerful engine in the world. The Nene was eventually built in vast numbers world wide but, apart from serving in two Fleet Air Arm fighters (the Attacker and Sea Hawk), it never really found favour in its home country. By the late 1940s both the Government and RAF were looking very closely at axial jet engines and the centrifugal Nene was felt to be somewhat out of date.

The Nene had a double-sided centrifugal compressor and it was considered sensible to place the intake as close as possible to it because an early criticism of single engine jet aircraft with nose intakes and long pipes was that the whole fuselage was full of wind and lacked sufficient space for equipment and fuel. A long jet pipe meant large energy losses, a critical aspect because of the low power of early engines, and the P.1040's intake and bifurcated pipe arrangement was seen as a way of keeping pipe length and energy loss to a minimum. It also proved to be the optimum aerodynamically, despite Rolls-Royce needing some convincing as to its suitability, and was probably the most important and innovative feature on the P.1040. The elimination of intake and exhaust ducting from within the fuselage

allowed Hawker to fit large-capacity fuel tanks both ahead of and behind the engine, a most unusual situation which kept the fuselage symmetrical about the centre of gravity (c.g.). Early jet engines were weighty objects and thus had to be kept as close to the aeroplane's c.g. as possible.

The first P.1040 brochure was completed in January 1945 and confirmed that the unique bifurcated pipe (patented the next month in the name of J.V.Stanbury) made room for a large fuel capacity in the tail. Its structure employed normal stressed skin practice based on Tempest and Sea Fury experience. Span was 36ft 6in (11.1m) and length 37ft 2in (11.3m). The project was generally approved by Rowe and Wardle and, after seeing it, Sir Wilfred Freeman said 'go right ahead'; the Controller of Research and Development (CRD) also suggested a fighter-bomber version. A full tender was submitted to Rowe on 27 February and he felt justified in accepting the Nene since it offered a good performance and range while lending itself to an experimental rocket boost installation for improving the rate-of-climb.

Design work began in March but some criticism was received regarding the air intakes. This problem was not cleared by RAE Farnborough until 21 September when

they were declared 90 per cent efficient, but it had already been agreed that the aeroplane was a considerable advance on present types. Early in October a new combined tender was submitted comprising the P.1040, the P.1047 (swept-back version with a rocket motor) and P.1046 (naval swept-wing version with a rocket). On 13 October Hawker Production Order No. 599190 was raised to cover the construction of a prototype P.1040.

During December Admiral Slattery visited Kingston and expressed great interest in the project but the firm was later advised by Rowe that, at this stage, the P.1040 was not regarded by the Air Staff as one of its new types (allegedly because it offered little performance improvement over the Meteor). Fortunately the Naval Staff saw it as a support fighter and suggested that the design should be re-schemed around the longer but more powerful Rolls-Royce AJ.65 axial engine (later the Avon). These developments prompted Sydney Camm to comment 'Thank God for the Navy' as they kept his jet design work alive. However, the second project (the highly swept-wing P.1049 Fleet Fighter with single AJ.65) was rejected by Hawker in mid-January 1946 as impractical since it would need swept-back wings to balance placing a pilot in the nose, a necessary move to assist deck landing. Swept wings were considered undesirable for the Fleet when the Nene lent itself to a conventional wing arrangement.

On 21 February 1946 an order was placed

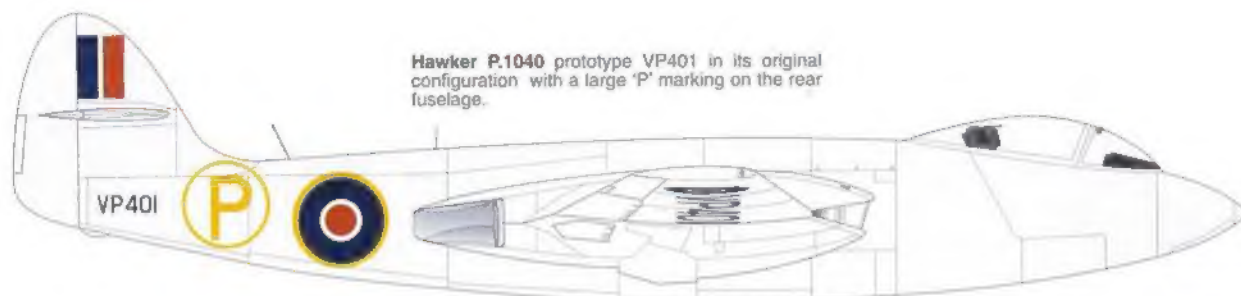
The third prototype (the second N.7/46) VP422 was fully navalised and more representative of series production standard than its predecessors. As it banks away from the camera the bifurcated jet pipe arrangement begins to come within view and the associated deep wing root and wing-body blending are well shown. VP422 was struck off charge in January 1958. (Ray Williams)



Hawker Sea Hawk camouflage and markings

Drawings by David Howley

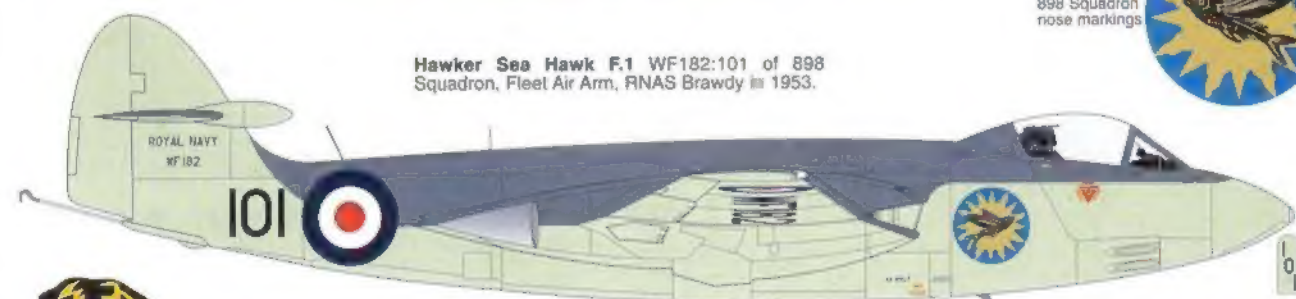
HAWKER SEA HAWK COLOUR KEY



Hawker P.1040 prototype VP401 in its original configuration with a large 'P' marking on the rear fuselage.



Hawker N.7/47 VP422 the second service evaluation aircraft in October 1949. This had a large 'P' marking on the rear fuselage but otherwise followed standard Royal Navy camouflage and markings.



Hawker Sea Hawk F.1 WF182:101 of 898 Squadron, Fleet Air Arm, RNAS Brawdy in 1953.

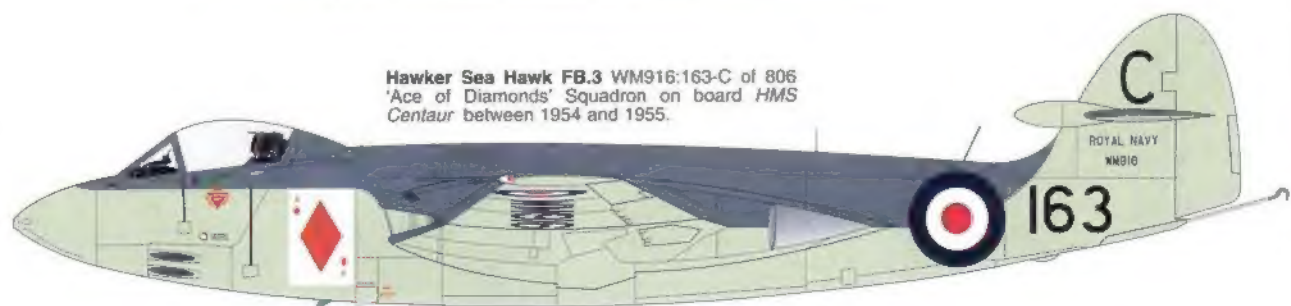
898 Squadron nose markings



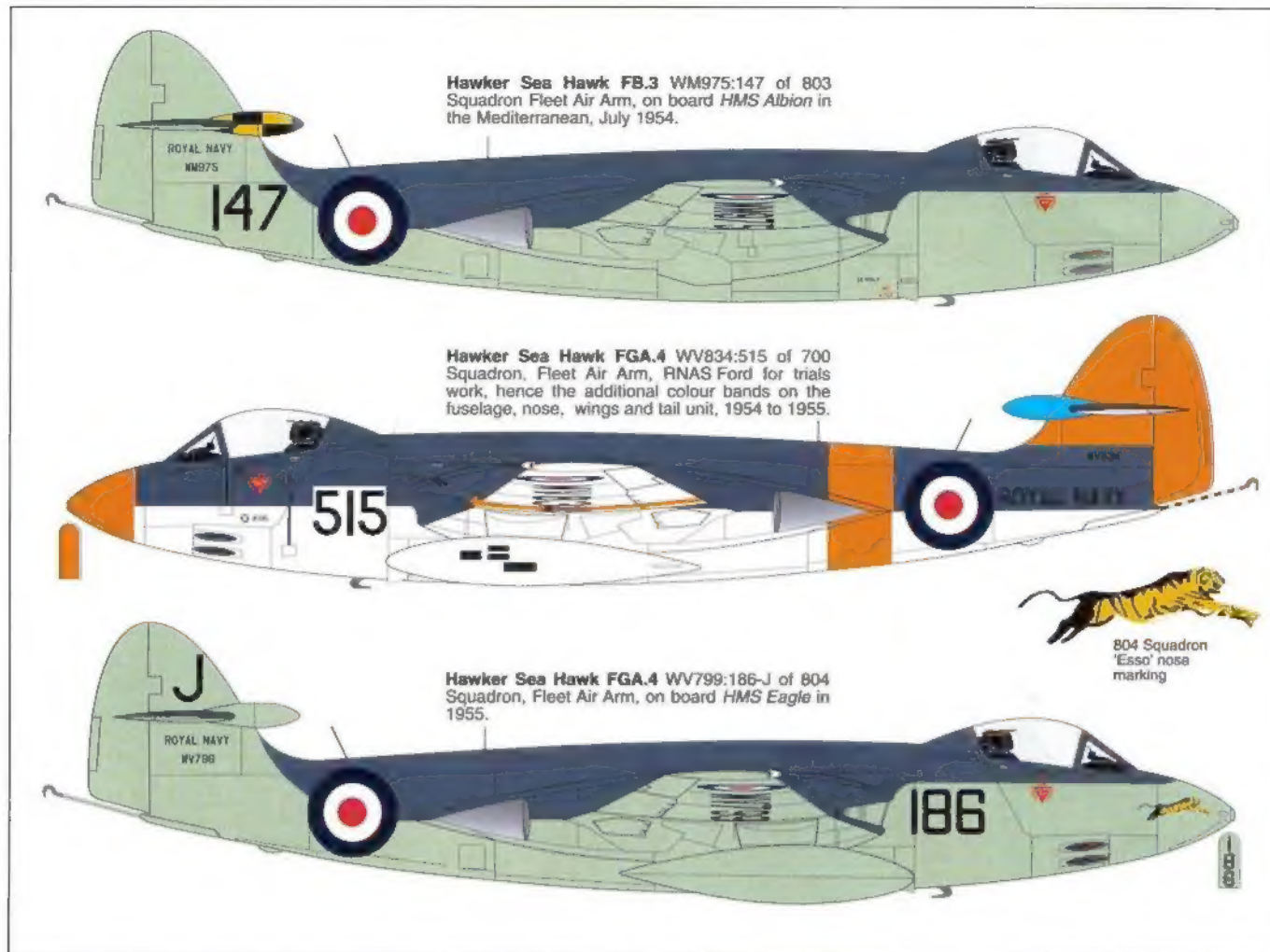
804 Squadron nose markings



Hawker Sea Hawk F.1 WF204 of 804 Squadron, Fleet Air Arm at RNAS Lossiemouth in 1954.



Hawker Sea Hawk FB.3 WM916:163-C of 806 'Ace of Diamonds' Squadron on board HMS Centaur between 1954 and 1955.



for three prototype P.1040 general purpose and long-range Naval fighter and strike support aircraft and for a further set of parts for structural tests. Specification N.7/46 was allotted to the project under Operational Requirement OR.218 and requested that the maximum level speed must fall inside the sea level to 15,000ft (4,572m) height band. Other demands included the best possible fighting manoeuvrability and a strike radius of 400 nautical miles (741km). Normal all-up-weight was not to exceed 14,000lb (6,350kg) and armament was to comprise four 20mm cannon with the option to replace this with two 30mm later on. This document was not ready for issue to Hawker until October and the first machine would have no guns despite provision to install them under the cockpit.

In March 1946 Sydney Camm, Hawker's famous Chief Designer, decided to introduce a leading edge wing spar into the centre fuselage and stub wing to increase torsional strength and at the end of the month preliminary work began on the second prototype, the first true naval prototype with folding wings. The firm was advised in June that the official target date for the first flight of the first machine, without folding wings, was February 1947 and the Mock-Up Conference was held on 10 and 11 October.

Study of the second production FMk.1 Sea Hawk, WF144, built by Hawker. This aircraft was used for extensive trials before being re-conditioned in 1955/56 and passed to FRU Hum. Note the original fin/tail junction arrangement. (BAE Systems)

The undercarriage for the second and third machines was to be capable of absorbing landings at 14 feet-per-second (4.27m/sec) when the first was cleared for only 11.75f-p-s (3.58m/sec).

HARDWARE AND FIRST FLIGHT

Metal cutting began during October 1945, two months before the return of Hawker's design staff to Kingston, but it was November 1946 before the first centre fuselage was joined to the front section in the Experimental Department. Design work was then interrupted and delayed by the ferociously hard winter of 1947 and the National crisis that came from it; the conse-

quent cutting off of heat and light closed the entire works from 10 to 28 February. Such progress that was made during this long season came in spite of difficult working conditions and this situation, and other problems, delayed the P.1040's first flight. The first Nene flight engine was delivered from Rolls on 15 April.

The first P.1040, serialised VP401, was sent to Langley aerodrome on 5 May and the Nene and its jet pipes were installed a month later, but after one engine run the pipes were removed and returned to Rolls for further modification, prolonging proceedings for another month. These pipes forced the Nene to be temporarily de-rated to 4,500lb (20kN) thrust and, to overcome this, Rolls began





Above: The all-silver P.1072 VP401 seen during a Farnborough air show before many of the modifications it suffered during its experimental life. Below: Like several early Mk.1s, WF147 was heavily used on trials work and never went to a squadron. It appeared at an SBAC show at Farnborough where this picture was taken (Flight)



manufacturing a redesigned pipe that would restore the full 5,000lb (22.2kN) level, but until the new arrangement was installed, the lower figure was the maximum available.

Taxying trials began at Langley on 23 June and in early July Hawker added a temporary fitting to the jet pipes to draw heat away from the fuselage. This worked fine and more taxying was completed on 11 July.

The fully modified original pipes arrived back from Rolls on 18 August and soon afterwards the first prototype was despatched to the Aeroplane and Armament Experimental Establishment (A&AEE) Boscombe Down for flight testing as Langley's grass strip was felt unsuitable for turbojet aircraft. Re-assembly was carried out at Boscombe and on 2 September 1947

the silver painted P.1040 made a satisfactory maiden flight in the hands of Hawker's chief test pilot Bill Humble. Three days later it was flown to Farnborough to continue testing.

Some buffeting was experienced in flight which was partly cured by blanking off the upper boundary layer duct exit. It was thought that the wing fillet adjacent to the jet pipe exit might be the cause and investigations led to the fitting of a modified form (see later). Between 13 to 17 October VP401 had a fin and tail intersection fairing fitted and the lower boundary layer duct exit blanked off. In addition, as a result of a flight on the 10th, the rudder trimming tab was locked so that the rudder was now controlled directly from the pilot.

On 3 November RAE's Lt. Cdr. Eric Brown flew VP401 to investigate the airframe vibration adversely commented on by Bill Humble (Humble's jet experience was limited). For taxying he found the all-round view excellent, the curved frameless transparent canopy placed so close to the nose gave a visibility probably unequalled by any contemporary fighter (the front section was later replaced by a framed flat screen to eliminate distortion), and steering was made easy by the tricycle undercarriage and powerful brakes. On take-off retraction of the undercarriage gave no appreciable change of trim but raising the flaps gave a strong nose-up pitch.

In cruise any increase in engine revolutions (rpm) set up a resonant vibration in the vertical plane throughout the airframe which emanated from behind the pilot. These vibrations were fairly mild and were felt at speeds between 230 to 300 knots (426 to

When photographed during deck landing trials aboard HMS Eagle in May 1952 Sea Hawk Mk.1 WF145 was in the hands of C Squadron A&AEE. The picture shows the auxiliary inlets on the upper fuselage. (Ray Williams)





556km/h). Conversely, closing the throttle set up a directional snaking in the 200 to 300 knots (371 to 556km/h) range which increased markedly the larger the drop in rpm. However, the vibration and snaking seemed to die out when the revolutions settled down to the new setting. Some yawing oscillations were felt in medium turns.

A 10 degree dive from 12,000ft (3,658m) with rpm set at 11,000 revealed a violent vertical shaking at 315 knots (584km/h) which was so severe that the blind flying panel's instruments became blurred at 325 knots (602km/h). Further dives at 20 degrees and 9,500rpm, and 30 degrees and

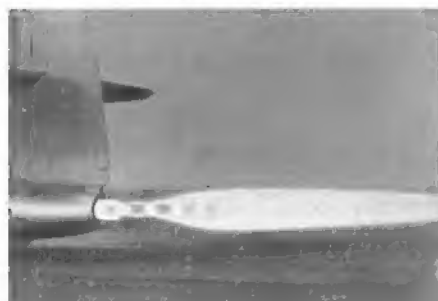
8,000rpm, both reached 350 knots (649km/h) perfectly smoothly. In terms of stability and control the ailerons were very light and very effective right down to the stall; the aircraft was unstable laterally and just stable directionally. The all-up stall was preceded by aileron twitching at 108 knots (200km/h) and buffeting at 106 knots (196km/h) before the starboard wing dropped at 102 knots (189km/h). In the all-down condition there was little warning bar some lateral rocking about two knots (3.7km/h) before the actual stall at 92 knots (170km/h). Once again the superb view and light and positive control reactions made the approach and landing straightforward.

Brown reported that the buffeting and vibration were associated with engine speed, not air speed. Airflow behaviour through the engine was an acute problem that needed

Four Kingston-built FMk.1 Sea Hawks, WF167, WF168, WF173 and WM902, taken soon after joining No. 806 'Ace of Diamonds' Squadron, the first front-line Sea Hawk operator, in March 1953. The unit's CO, Lt. Cdr. Pat Chilton, reported that the Sea Hawk interceptor made high speed flying just like "armchair flying". These aircraft have now acquired the bullet fairing at the tailplane/fin junction introduced during the Hawker production run. (Ray Williams)

solving but he felt the aircraft promised to be a very fine aircraft, particularly in regard to its deck-landing role. By April 1948 this in-flight vibration had been completely overcome by the fitting of leading edge mass balanced elevators. An acorn fairing introduced at the leading edge of the fin and tailplane intersection provided a very successful cure, but not before a good deal of thought and frustration had been expended. The P.1040's rectangular heat shield fairings were also substituted by a more attractive pen nib form which cured the vibration caused by airflow breakaway.

Design clearance for the new strengthened divided jet pipe with deflected nozzles arrived from Rolls and this was fitted to VP401 in mid-November 1947, allowing the engine to run at the full 5,000lb (22.2kN) thrust. At the same time the aircraft was broken down for the installation of the modified jet pipe exit fillet (above) in which form it flew again on 26 November. The next day Sqn. Ldr. T. S. 'Wimpy' Wade, recently recruited by Hawker, took over P.1040 test flying. During a flight on 29 December the hydraulic pump failed and VP401 was landed without the nose wheel deployed which damaged the forward fuselage and suspended further flying until 10 March 1948. In addition, strength tests on the structural specimen at Langley, ongoing since August 1947, produced a spar failure at a lower than predicted fatigue level and the design of a



Left: The Snarler rocket motor being fired during early tests. Below: Picture showing the P.1072 (ex-P.1040) VP401 as rebuilt with an Armstrong Siddeley AS Sn1 Snarler rocket in the rear fuselage. Note the pipework fairing beneath the fuselage, fin/tail bullet fairing and rear view mirror above the cockpit.





reinforced centre section had to be put in hand.

Towards the end of May 1948 the P.1040 was demonstrated to the Central Fighter Establishment at West Raynham and to the Navy at Lee-on-Solent. On 19 July the existence of the P.1040 was revealed to the public and on 24 August Wade demonstrated VP401 to the Press. VP401 had always been a land-based aerodynamic prototype without weapons and other military equipment; the second and third machines were the naval N.7/46 prototypes. The first of these, VP413, made its maiden flight on 3 September without guns, but these were fitted in November. From this flight VP413 was henceforth officially termed the N.7/46 while VP401 was the P.1040.

By now it was possible to make a preliminary estimate of VP401's performance. The indications were that engine thrust was some 10 per cent lower than the quoted figure, a fact manifested by a rather poor rate of climb with, at the same time, a good top

Lovely colour view of Sea Hawk Mk.1 WF159. The aeroplane has no markings and, as it came under CS(A) control between January and September 1953, it was probably between these dates when the photo was taken. (Eric Morgan)

speed which indicated that it was unlikely that the aircraft's drag was high. Spinning trials conducted during late November gave satisfactory results. VP413 eventually introduced the full gun armament, folding wings and catapult strongpoints but the third prototype, VP422, was more representative of planned production machines and this flew on 17 October 1949. It differed from VP413

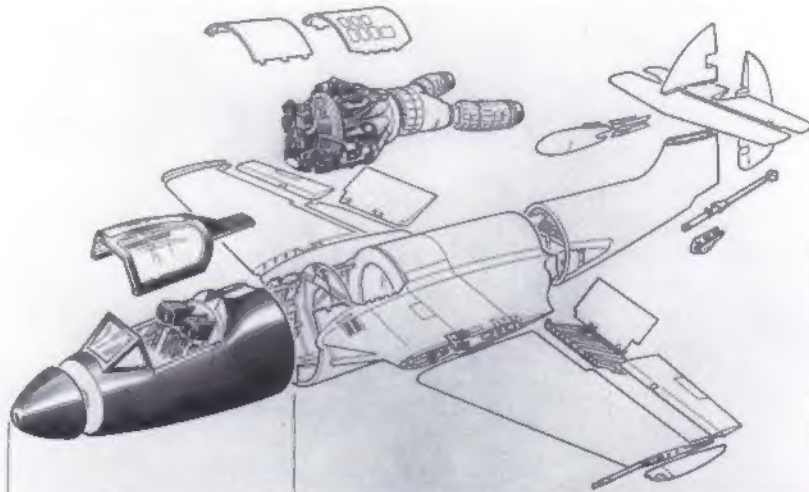
Sea Hawk F Mk.2 WF277 received code '608' when it rejoined No. 736 Squadron in March 1957 and retained it right through to 1963 while serving as maintenance airframe A2354. (Air-Britain)

in having provision for RATO (Rocket Assisted Take-Off), a faster undercarriage retraction sequence and the capability to carry auxiliary drop tanks.

OFFICIAL TESTING

In March and April 1949 both N.7/46s were used for assisted take-off and arrested landing trials on the dummy deck at RAE Farnborough before VP413 passed to A&AEE for extensive deck assessment trials. By 7 June it had completed eight landings aboard *HMS Illustrious* with satisfactory results but there were clear indications

General arrangement and component breakdown drawing of the proposed side-by-side Sea Hawk trainer of 1947-48. The only change to the existing Sea Hawk structure was the new forward fuselage but neither this or an alternative tandem seat trainer were built. (Ray Williams)





Hawker Sea Hawk FGA.4 WV867:167-C of 806 Squadron, Fleet Air Arm, on board *HMS Centaur* in 1955.

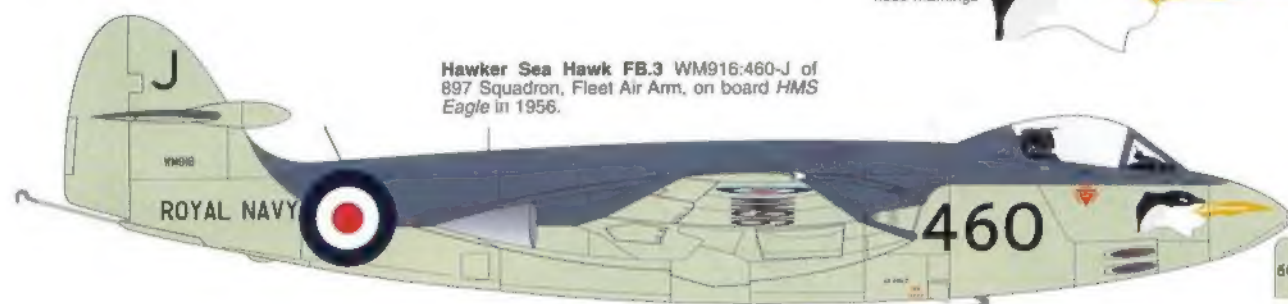


Hawker Sea Hawk FGA.6 XE365:103-O of 800 Squadron, Fleet Air Arm, on board *HMS Ark Royal* in 1955.



Hawker Sea Hawk FGA.4 WV831:195-J of 804 Squadron, Fleet Air Arm, on board *HMS Eagle*, September 1955.

897 Squadron nose markings



Hawker Sea Hawk FB.3 WM916:460-J of 897 Squadron, Fleet Air Arm, on board *HMS Eagle* in 1956.

80



Hawker Sea Hawk FGA.6 XE365:171-B of 804 Squadron, Fleet Air Arm, on board *HMS Bulwark* in November 1956.

804 Squadron nose markings



Hawker Sea Hawk FGA.6 XE409:161-O of 804 Squadron, Fleet Air Arm, on board *Ark Royal* during the Suez crisis, November 1956.

81



Above: Two Sea Hawk Mk.3 aircraft from No. 898 Squadron on the lift of *HMS Albion* in September 1954. WM929 was rebuilt to FB.Mk.5 standard in 1956 and sold to India in 1961. No such luck for WM971 which crashed into the sea in October 1956, the pilot ejecting safely. (Flight via Ray Williams) Right: Sea Hawk FGA.Mk.6 of 898 Squadron about to take the arrestor wire on board *HMS Eagle* toward the end of the aircraft's first line status.

that the high take-off speed was a severe limitation to the aircraft. Both longitudinal and lateral stability were neutral and directional stability positive, while the ailerons, elevators and rudder were all found to be light and effective. The lowest comfortable approach speed was 105 knots (195km/h) Indicated Air Speed (IAS); at lower speeds any increase in the descent rate could not be corrected easily.

Another 28 landings were made on *Illustrious* during October and November after VP413 had received a wing extension.



Trials with VP401 had dictated an increase in span of 2ft 6in (76.2cm) which was agreed and fitted to VP413 in July 1949

before the second set of trials on *Illustrious*. This modification had first been called for in September 1946 to help meet the take-off and landing requirements. The extra span compensated the growth in weight from additional equipment and helped take-off and landing performance; in September the tailplane span was also increased by 1ft (30.5cm).

A&AEE's report considered VP413 had very good deck landing characteristics with a good forward view, even in rain. The tri-cycle undercarriage with long stroke oleos contributed largely to this aspect but a lack of airbrakes (yet to be fitted) meant slowing down was difficult and this was found to be a serious disadvantage. The optimum approach speed was calculated to be 115mph



Sea Hawk FB.Mk.3 WM976 was part of the batch of 116 built but its history is not clear as no record exists of any squadron association and no squadron identification can be seen in this picture. (MAP)



Squadron portraits. Above: A group of No. 898 Squadron F Mk.1 Sea Hawks. WF182 nearest (101), then WF170 (109), WF185 (104), WF158 (103) and probably WF180 (105) behind. Date late 1953 or early 1954. (Ray Williams) Below: One of the first Sea Hawk units to form was 806 Squadron who used an Ace of Diamonds playing card as their nose marking. These four Sea Hawks F Mk.1s were all Kingston-built and were amongst the first to have the bullet-shaped fairing in front of the tail unit which was featured on all following variants.



(185km/h) at 10,000lb (4,536kg) weight, 118mph (190km/h) at 10,500lb (4,763kg).

The sting type arrestor hook, however, was seen as a potential and frequent source of damage to the rudder and problems occurred twice during the trials. This relatively short hook tended to miss the arrestor cables and it was recommended that an 'A' frame type hook should be fitted instead further forward under the fuselage; however, the problem was solved by fitting a much longer hook which, when stowed, extended beyond the rear fuselage. Unassisted carrier take-off performance was very poor and at comparatively light weight (half fuel and no ammunition) the carrier's full length was required to get off despite an over the deck windspeed of 40 to 45 knots (74 to 83km/h). A trial installation was made in December 1949, using VP422, of an upper split trailing edge dive recovery flap interconnected with the landing flaps to act as air brakes and create increased drag on the approach but this was found to introduce more disadvantages than advantages.

During April 1950 VP413 was assessed by A&AEE for handling at high Mach numbers. The maximum indicated Mach number that could be achieved with the aircraft under control in a straight dive was just under 0.86 which was considered very commendable for a straight wing aircraft. However, because of severe airframe buffet and wing drop, the aircraft would not be a satisfactory gun platform above 0.83 Indicated Mach Number in straight flight. The ailerons were found to be unsatisfactory at high Mach numbers and above 350 knots (649km/h) IAS and serious consideration was requested for incorporating power assisted ailerons on Service aircraft; lighter and more effective elevators would also be

Hawker Sea Hawk units and representative aircraft

Primary source: Roundel, published by British Aviation Research Group

Fleet Air Arm Units

700 Squadron (formed August 1955 from merger of 703 and 771 Squadrons)

F.Mk.1 WF233
F.Mk.2 WF259
FB.Mk.3 WF280, WM906, WM914
FGA.Mk.4 WV795, WV801, WV851
FB.Mk.5 WM931
FGA.Mk.6 WV834, XE403, XE438

703 Squadron

F.Mk.1 WF152, WF153, WF233
FB.Mk.3 WM906

736 Squadron (Known as the Operational Flying School Pt.II [Jet], then became the Naval Air Fighter School with 738 Squadron, then the Sea Hawk OFS I & II)

F.Mk.1 WF154, WF162, WM902
F.Mk.2 WF265
FB.Mk.3 WF301, WM909, WN105
FGA.Mk.4 WV826, WV833, WV864
FB.Mk.5 WF302, WM913, WM974
FGA.Mk.6 WF284, WV801, XE370

738 Squadron (in 1955 became Naval Air Fighter School with 736 Squadron, then the Naval Strike School in the early 1960s)

F.Mk.1 WF172, WF226, WF232
F.Mk.2 WF253, WF264, WF276
FB.Mk.3 WF303, WM934, WM999
FGA.Mk.4 WV792, WV855, WV913
FGA.Mk.6 WV908, XE327, XE366

764 Squadron (from June 1957 known as the Advanced Weapon Training School)

F.Mk.1 WF158, WF175, WF213
F.Mk.2 WF242, WF255, WF275
FB.Mk.3 WF295, WM999, WN107
FGA.Mk.4 WV802, WV870, XE327
FGA.Mk.6 XE389, XE407, XE461

767 Squadron (Deck Landing Trials Squadron)

F.Mk.1 WF175, WF213, WM905
F.Mk.2 WF249, WF260, WF274
FB.Mk.3 WF286, WM920, WM994

781 Squadron (Joint Officers Air Course Unit)

FGA.Mk.6 WV856, XE390

787 Squadron (Naval Air Fighting Development Unit - for trials)

FGA.Mk.4 WV795, WV807

800 Squadron

FB.Mk.3 WM991, WN110, WN115
FGA.Mk.4 WV805, XE330
FGA.Mk.6 WV912, XE365, XE455

801 Squadron

FGA.Mk.4 WV846, WV914, XE338
FGA.Mk.6 WV803, WV906, XE445

802 Squadron

F.Mk.1 WF216, WF225, WF232
F.Mk.2 WF244, WF266, WF279
FB.Mk.3 WM938, WM984, WN118
FGA.Mk.4 WV792, WV864, XE328
FB.Mk.5 WF287, WM939, WM961

803 Squadron

FB.Mk.3 WF286, WM974, WM984
FGA.Mk.6 WV798, XE368, XE446

804 Squadron

F.Mk.1 WF177, WF212, WF215
FGA.Mk.4 WV799, WV836, XE337
FGA.Mk.6 WV833, XE336, XE460

806 Squadron 'Ace of Hearts'

F.Mk.1 WF165, WF175, WM905
FB.Mk.3 WM910, WM922, WM938
FGA.Mk.4 WV842, WV861, WV910
FB.Mk.5 WF300, WM969, WN119
FGA.Mk.6 WV841, XE457, XE489

807 Squadron

F.Mk.1 WF189, WF213
F.Mk.2 WF254, WF262, WF268
FB.Mk.3 WM995, WN107, WN113
FGA.Mk.4 WV849, WV919, WV921

810 Squadron

FGA.Mk.4 WV844, WV922, XE331
FGA.Mk.6 WV796, XE403, XE405

811 Squadron

FB.Mk.3 WM943, WM979, WN117
FGA.Mk.4 WV839, WV903

895 Squadron

FB.Mk.3 WM913, WM972, WN111
FGA.Mk.4 WV804, WV833
FGA.Mk.6 XE381, XE440, XE444

897 Squadron

FB.Mk.3 WM917, WM968, WN115
FGA.Mk.6 WV907, XE362, XE439

898 Squadron

F.Mk.1 WF158, WF186, WF213
FB.Mk.3 WM920, WM960, WM973
FGA.Mk.4 WV856, WV908, WV919
FGA.Mk.6 XE344, XE367, XE448

899 Squadron

FGA.Mk.6 WV797, XE364, XE450

Southern Air Division, RNVR (comprising 1832, 1835 & 1836 Squadrons)

F.Mk.1 WF173, WF233 (with No. 1832),
WF234 (with No. 1836)

Airwork FRU

F.Mk.1 WF144, WF191, WM905
FB.Mk.5 WF296, WM936, WN108
FGA.Mk.6 WV796, XE330, XE489

Naval Aircraft Radio Installation Unit (NARIU)

F.Mk.2 WF241
FGA.Mk.6 WV828, WV916

School of Aircraft Handling

FB.Mk.5 WM969 (as SAH-5)
FGA.Mk.6 WM913 (SAH-1), WV826 (SAH-2), XE339 (SAH-6)

Numerous Sea Hawks, particularly early production examples, served with the Royal Aircraft Establishment (RAE) and Aeroplane & Armament Experimental Establishment (A&AEE). F.Mk.1 WF146 went to the Empire Test Pilot's School (ETPS) at Farnborough in September 1955 and another, WF148, to CEPE (Climatic Dept.) at Namao, Alberta, in October 1952.

Royal Netherlands Naval Air Service

All FGA.Mk.50 aircraft were allocated to either 860 Squadron or No. 3 Training Squadron.

West German Navy

Marinefliegergruppe 1
Mk.100 VA+220 to VA+236 Mk.101 RB+240 to RB+256
Marinefliegergruppe 2
Mk.100 VB+120 to VB+136 Mk.101 RB+360 to RB+376

Indian Navy

The majority, including IN151 to IN163 inclusive, joined INAS 300 but some examples also went to INAS 551.

very helpful) at high Mach numbers.

VP413 was used as an air show demonstration aircraft during 1950 attending several events around the country while VP422 was employed on gunnery and drop tank handling flights during the spring. VP422 had made another 28 carrier landings between 13 and 17 February 1950 and undertook gun firing trials at Ford and Tangmere between 13 and 22 March 1951.

Sea Hawk FB.Mk.3 WN108 of 897 Squadron, about to catch the wire on HMS Eagle in 1956. The nose marking shows the head of a Caspian Tern. (Ray Williams)





VP413 received production style air brakes, ailerons and the larger span tailplane in February 1951 but it did not fly again until 18 September.

RATO AND TWIN SEATS

By October 1947 both Hawker and RAE had made estimates for an improved take-off performance using varying numbers of rockets and it was considered that a further P.1040 prototype could be provided with a 2,000lb (8.9kN) rocket installation. However, no design work was undertaken by the Experimental Department for over six months and so VP401 was chosen as the mixed-propulsion test aircraft since its test programme was now complete. By June 1948 great interest in rocket boost was forthcoming from official circles. On 1 August 1949 Wade won the SBAC Challenge Cup at Elmdon Air Races flying this aircraft at a speed of 510mph (821km/h) and two months later it was returned to Richmond Road for the fitting of a 2,000lb Armstrong Siddeley Snarler liquid fuel rocket motor in the rear fuselage beneath the rudder. This motor had a 2.75 minutes endurance and the project was redesignated P.1072.

Initial investigations suggested introducing sweep-back to the aeroplane to avoid the large amount of ballast that had to be put in the nose. In the event the original wings were used but reinforced to cater for the extra loading of the rocket conversion. There were severe delays in getting the machine ready; one reason being the slow delivery of stainless steel piping from the engine firm for fitting externally under the fuselage (when faired over this gave the impression VP401 had a ventral keel) while the MoS demanded modifications to Anstey's test bed as a safety precaution. Disappointingly, VP401 remained idle in the Experimental Shop until the rocket equipment was finally installed in June 1950.

To fit the Snarler the base of the rudder was cut back just beneath the bottom of the trim tab, although total fin area was increased by alterations to the leading edge and tip, and the rear fuselage was converted to circular section to accommodate the rocket. A large bullet fairing was fixed to the fin/tail leading edge to neutralise turbulent

flow. New fuel tanks were installed in the nose (75gal. [34lit]) for liquid oxygen and aft of the cockpit (120gal. [546lit]) for water-methanol, the liquid oxygen acting as an oxidiser for the methanol. Internal jet fuel was cut to 175gal. (796lit) and a Mk.2 Nene was installed. An external rear view mirror was placed above the forward canopy to ensure the pilot could see if the rocket was functioning correctly.

VP401 flew to Bitteswell on 16 November to ground test the rocket motor and clear it for the first air test. The first flight with rocket power was made on 20 November and all of the fuel was consumed with satisfactory results. By January six very successful flights had been completed and a striking rate of climb demonstrated (extrapolation of the results suggested a potential 50,000ft [15,240m] in 3.5 minutes from wheels rolling) but on the last trip a faulty

WF161 became '034' when it joined Airwork in August 1957 but this view was probably taken when in the hands of Abbotsinch Aircraft Holding Unit (AHU) between June 1958 and July 1960, after which it went for scrap. (MAP)

pressure gauge transmitter exploded which blew out the sides of the fairings and caused appreciable minor damage. After repair a further ground run was made at the end of February but, sadly, the aircraft never flew again being struck off charge on 10 August 1954 and scrapped.

The P.1072 had been the first British mixed-power experimental prototype to fly but despite its success technical problems, and the realisation that jet reheat instead of rocket boost was the way forward, brought termination of the programme. It was not the pilot's favourite. The rocket was not throttleable, the flying controls were only manual and the cockpit was not pressurised. As a result the aircraft would accelerate into Mach-induced buffet and if the pilot tried to reduce the speed by entering a climb, his limit for unpressurised flight (40,000ft [12,192m]) could be reached too quickly.

Sydney Camm offered tentative details for a dual version P.1040 on 28 August 1947. There were two proposals, one with side-by-side seating (as eventually used on the Hunter T.Mk.7) of empty weight 7,560lb (3,429kg) and all-up-weight 10,800lb (4,900kg), the other had tandem seats and weighed 7,240lb (3,284kg) empty rising to 10,200lb (4,627kg) at all-up-weight. In the event the two-seat Sea Hawk trainer was seen as a difficult project to undertake, and

Sea Hawk FB.Mk.3 WM920 seen without squadron markings at Lee-on-Solent in June 1957. (Air-Britain Colour Library)

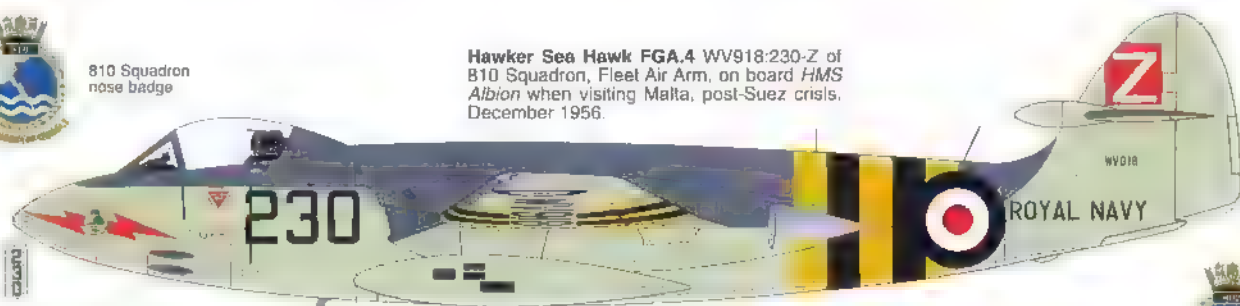


Sea Hawk FB.Mk.3 WM925 on air show static display, again at Lee-on-Solent in June 1957. (Air-Britain Colour Library)



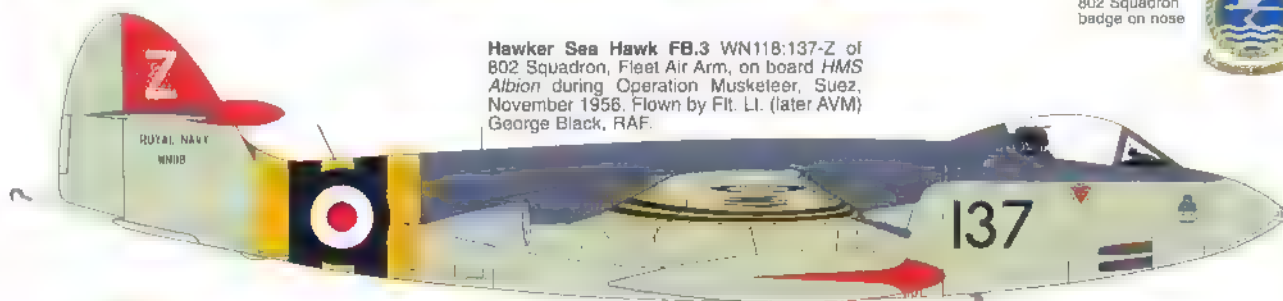
810 Squadron
nose badge

Hawker Sea Hawk FGA.4 WV918:230-Z of
810 Squadron, Fleet Air Arm, on board *HMS
Albion* when visiting Malta, post-Suez crisis,
December 1956.

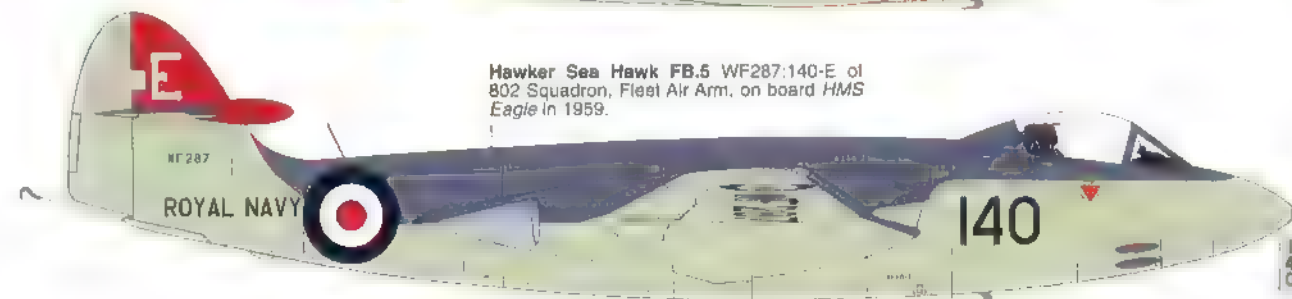


802 Squadron
badge on nose

Hawker Sea Hawk FB.3 WN118:137-Z of
802 Squadron, Fleet Air Arm, on board *HMS
Albion* during Operation Musketier, Suez,
November 1956. Flown by Flt. Lt. (later AVM)
George Black, RAF.



Hawker Sea Hawk FB.5 WF287:140-E of
802 Squadron, Fleet Air Arm, on board *HMS
Eagle* in 1959.



uneconomic, and so it was dropped in late
December 1948. One might have expected a
two-seater to be essential for a carrier fighter
but, instead, future Sea Hawk pilots
trained on Gloster Meteor T.Mk.7s and de
Havilland Vampire T.Mk.11s.

PRODUCTION DIFFICULTIES

The N.7/46 Production Specification (for a
Sea Fury Replacement), 25/48/P of 17

January 1949, specified a Nene 4 together
with Rocket Projectiles (RPs) in lieu of drop
tanks and a high speed, if necessary at the
expense of rate of climb. By February 1949
deep discussions were underway regarding
the type's production standard and Hawker
reported that the number of additional items
planned for fitting was causing the firm considerable
embarrassment. Canm told the
Ministry of Supply (MoS) that these would
cause delay while all-up-weight would

increase by over 400lb (181kg).

The first production contract, for 151 air-
craft now christened the Sea Hawk and
based on the P.1040, was placed with
Hawker on 22 November 1949. A pres-
surised cockpit and a Martin-Baker ejection
seat were introduced. The firm was advised
Line-up of 811 Squadron Sea Hawk FB.Mk.3s,
with distinct fin markings, in summer 1955,
probably at Lossiemouth. Code '161' nearest is
WM965, '166' behind is WM923, '159' next is
WN119. (Alan Hall)





Sea Hawk Mk.4 WV858 as '163' of No. 806 (Ace of Diamonds) Squadron. (Air-Britain Colour Library)



on 7 November 1947 by its Resident Technical Officer (RTO) that Martin-Baker seats should be adopted as standard for production machines but the considerable amount of development time and money spent on the P.1040's Malcolm type seat, and the large amount of alteration necessary to fit the replacement, meant this request was not well received. Development of the Malcolm seat was eventually discontinued.

On 8 July 1952 the Parliamentary Secretary A.R.W. Toby Low reported on the Sea Hawk and fully described the problems and delays experienced in delivering production aircraft. These machines differed considerably from the original P.1040 and N.746s and it was initially intended that the first production aircraft should act as a prototype and be advanced as far as possible by hand manufacturing methods. Original estimates expected the first delivery to be in July 1951 with CS(A) Release the next September. However, adaptation of the P.1040 proved more difficult than expected while the concurrent design demands of the Hawker Hunter made for a shortage of staff and further delayed the P.1040's redesign. Sea Hawk production drawings were not completed until July 1952.

To accord with the Government's concern for producing an aircraft that was superior to the Soviet's MiG-15, a very impressive fighter recently unveiled in the Korean War, from autumn 1950 Hawker had given priority to the Hunter within its Design and Drawing Office Departments. Thanks to the panic brought about by the war 'Super Priority' status was accorded to the Hunter on 26 March 1952. The manufacturer considered this impeded Sea Hawk design and drawing work and Low stated that the appli-

WV831 was a Sea Hawk FGA.Mk.4 and is seen as '637' of No. 738 Squadron in 1957-58 when shore-based at Lossiemouth. The squadron later became the Naval Fighter School after combining with 736 Squadron (MAP)

cation of 'Super Priority' to the Hunter delayed Sea Hawk production from a forecasted 80 in 1952/53 to 35 and from 50 to 23 by 31 December 1952. This overload in Kingston's workload was the prime reason why Armstrong-Whitworth, who had spare production capacity, took on the responsibility of completing the programme.

Initial Sea Hawk production was undertaken at Kingston and Langley, and the newly acquired Dunstons airfield, until 35 Mk.1 aircraft had been completed. However, such was the level of Hunter work that by 1952 the entire Sea Hawk development and production programme had been passed to Armstrong Whitworth Aircraft Ltd (AWA), a sister firm within the Hawker Siddeley Aircraft Company. AWA built all the subsequent production aircraft, manufacture being undertaken at Baginton, Coventry, before transfer by lorry to Bitteswell, near Lutterworth, for assembly and flight. Over 1,000 Gloster Meteors were built at Baginton and these could comfortably take-off from the airfield's yet to be concreted grass strip, but the Sea Hawk needed high pressure tyres for carrier landings and so flight testing, complete with the AWA Flight Department, was moved to Bitteswell to utilise that factory's tarmac runway.

A series of problems arose during the final stages of production which delayed the first flight of the first production machine, WF143 with Nene Mk.101, until 14 November 1951. Hawker's own flight trials began at Dunstons and 9.5 hours flying were

Right: F8.Mk.5 WN108 seen in FRU Hurn black livery and coded '033'. Today this machine is preserved at Langford Lodge in Ulster. Below: Another all-black aircraft seen at Hal Far in 1960 is Mk.6 XE334:036. Note the searchlight in the nose of the underwing pod. (Godfrey Mangion)



completed by year's end, mostly on stability and control investigations which revealed faults with ailerons, flaps and dive brake. Such were the nature of these problems that WF143 in essence became a prototype and all flying was stopped for two months to effect immediate modifications on the first two aircraft and to subsequent manufacture which held up the production line. Lateral control was weak at speeds over 400 knots (741km/h) due to aileron oscillation but the ideal solution proved to be power controls

fitted on the fifth machine, WF147, thus making it a prototype for the Sea Hawk F.Mk.2. The second Sea Hawk F.Mk.1 WF144 flew on 21 February 1952.

The arrival of production aircraft, however, accelerated the evaluation programme. Contractor's clearance testing was completed on 22 April 1952 and WF144 was then sent to RAE for arrested landing and catapult trials. WF144 and WF145 made successful deck landing trials on HMS Eagle in May 1952 when their landing characteristics





were described as excellent with catapulted take-offs straightforward. On 4 September WF148 was despatched for winterisation trials in Canada and another machine, WF149, was used by A&AEE for gun firing tests from 11 March 1953 until it fatally crashed on 27 June after the port wing folded on take-off.

But because of the overall delay only two aircraft had been delivered to CS(A) by 1 July 1952 while eight more were at Dunsfold for final assembly and testing; none had been delivered to the Admiralty. By March 1953 five aircraft were in the hands of the first Sea Hawk operational unit, No. 806 Squadron at Brawdy, and another eleven, including the first nine production machines, were undertaking various trials programmes.

SEA HAWK STRUCTURE

The Sea Hawk had an all-metal structure and

its mid-fuselage cantilever wing was covered with stressed heavy-gauge skin. The outer wings were attached to the stub wings by two hinge fittings with automatic locks plus a spigot bearing in the leading edge and these were folded by power operation. Hydraulically operated double split type combined landing and brake flaps were employed and outboard of these were ailerons using spring tabs. The full power aileron system was cleared on WF147 in June 1953. The stub wings were built integrally with the centre fuselage. Both nose and centre portions of the fuselage were semi-monocoque reinforced by a box-section keel member and four longerons. The rear fuselage was pure monocoque with the fin base an integral part of its construction and the cantilever one-piece multi-spar tail passed through the fin above the fuselage. The elevators used controllable trim-tabs.

Originally the P.1040 was planned to have only front and rear spars in the wing with no

Uncoded Sea Hawk Mk.5 WM994 seen at Hal Far, Malta, in 1960 as part of the Search and Rescue Flight. A rather ignominious end for a beautiful fighter aircraft. (Ray Sturtivant)

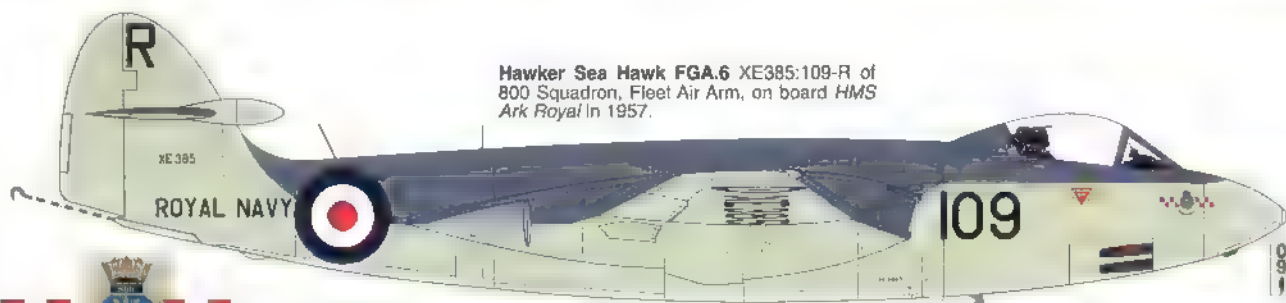
spanwise stiffening of the skins. It was thought that the skin would remain unbuckled at 1g and would operate in the 'post-buckled' state at high loadings. However, on test the skin did buckle and two stringers ahead of and behind the main spar on the upper and lower skins were quickly added. These proved satisfactory and were retained when both wing folding and the 2.5ft (76.2cm) span increase were introduced.

Since this was a carrier aircraft the fuselage had to be stressed for tail-down accelerated take-offs for which a single point was fixed beneath the fuselage to attach the catapult. A long sting-type arrestor hook was fitted to the rear fuselage and the tricycle undercarriage had main gears retracting inwards into the centre fuselage. Four 20mm cannon were mounted in the lower nose and the later Mark 3, 4, 5 and 6 aircraft had provision for carrying underwing bombs or rocket projectiles (RPs). The cannon installation was initially criticised for poor access and much improved access doors were duly fitted once proposals to use a 'gun-pack', similar to that employed on the Hunter, were rejected.

The pilot was housed well forward in the nose of the fuselage and, as noted, production aircraft had a Martin-Baker ejection seat. In the P.1040 and N.7/46s, however, the seat contract went to R. Malcolm Ltd.

Three 898 Squadron Mk.6s, XE444, WV850 and XE340, on a sortie from HMS Eagle in the early months of 1959. The squadron disbanded on 30 April. Note the later camouflage style of XE444, nearest, and the HF and VHF aerials protruding from the upper rear fuselage. (Ray Williams)





Hawker Sea Hawk FGA.6 XE385:109-R of 800 Squadron, Fleet Air Arm, on board HMS Ark Royal in 1957.



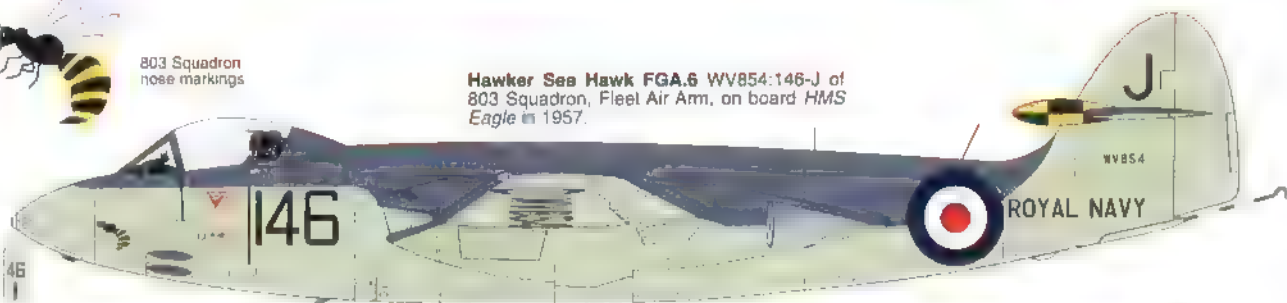
800 Squadron nose markings



Hawker Sea Hawk FB.3 WM934 of 738 Squadron, Fleet Air Arm, 'Red Devils' aerobatic team that performed at the SBAC show, Farnborough and various other air displays during the 1957 season.



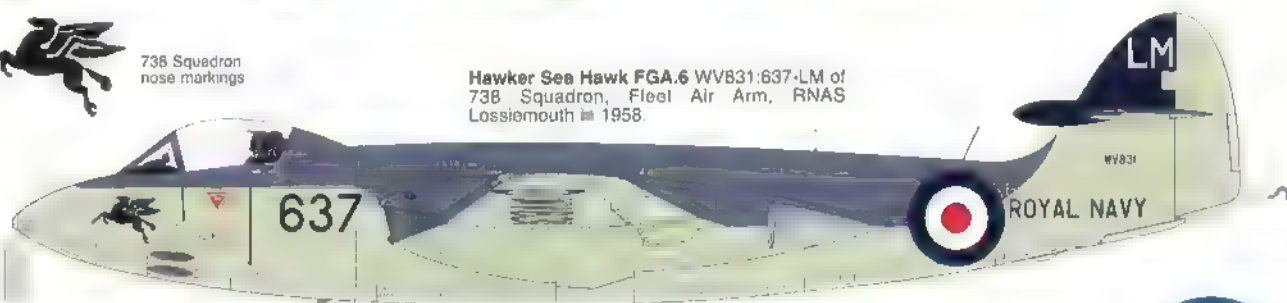
803 Squadron nose markings



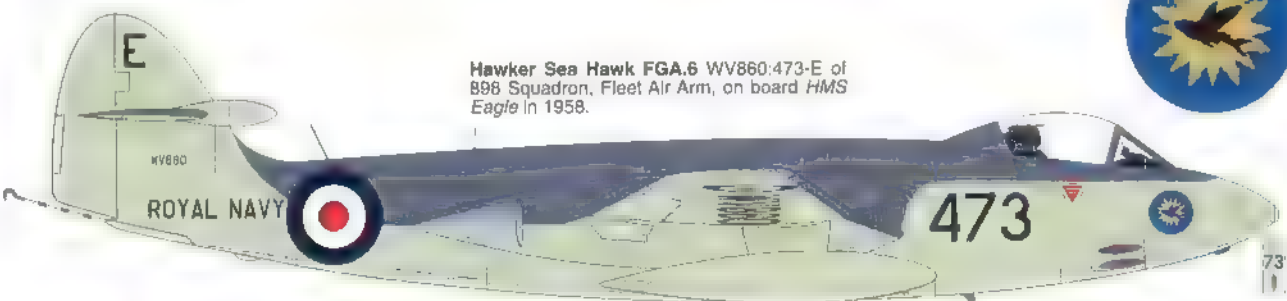
Hawker Sea Hawk FGA.6 WV854:146-J of 803 Squadron, Fleet Air Arm, on board HMS Eagle in 1957.



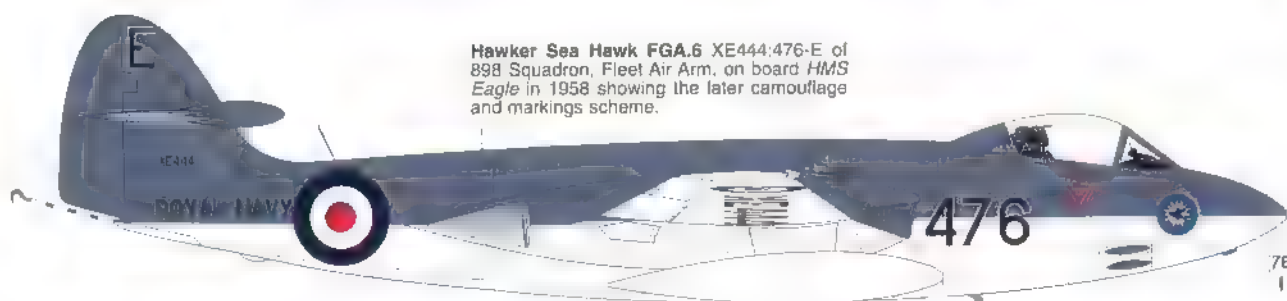
738 Squadron nose markings



Hawker Sea Hawk FGA.6 WV831:637-LM of 738 Squadron, Fleet Air Arm, RNAS Lossiemouth in 1958.



Hawker Sea Hawk FGA.6 WV860:473-E of 898 Squadron, Fleet Air Arm, on board HMS Eagle in 1958.



Hawker Sea Hawk FGA.6 XE444:476-E of 898 Squadron, Fleet Air Arm, on board HMS Eagle in 1958 showing the later camouflage and markings scheme.



Above: Royal Naval precision. Not a nose is an inch out of line in this picture which shows 804 Squadron FGA.Mk.6 Sea Hawks when shore based. Sea Hawk XE387, the lead aircraft, was built as new as a Mk.6. (Air-Britain) Left: XE365's folded wings reveal the underlying rocket rails fitted to the FGA.Mk.6 (MAP)



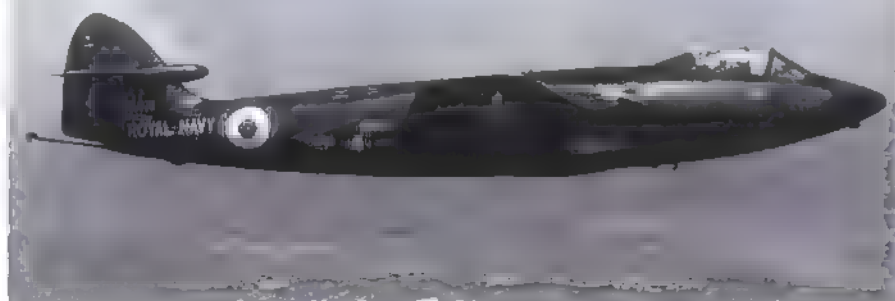
the installation being approved in August 1948, probably because Camm at the time was not well acquainted with Sir James Martin and the pair had previously shared some acrimonious discussions. The Nene engine was housed in the centre fuselage with the intakes in the stub-wing leading edge roots. The exhaust was split again to exit through the famous bifurcated jet pipes in the union of the wing root trailing edge and the fuselage each side of the fuselage. A boundary layer bleed was placed at the junction with the fuselage side and spring-loaded doors in the top surface of the centre fuselage provided additional air intakes for ground running and take-off. As the pressure in the plenum chamber increased, these doors closed automatically.

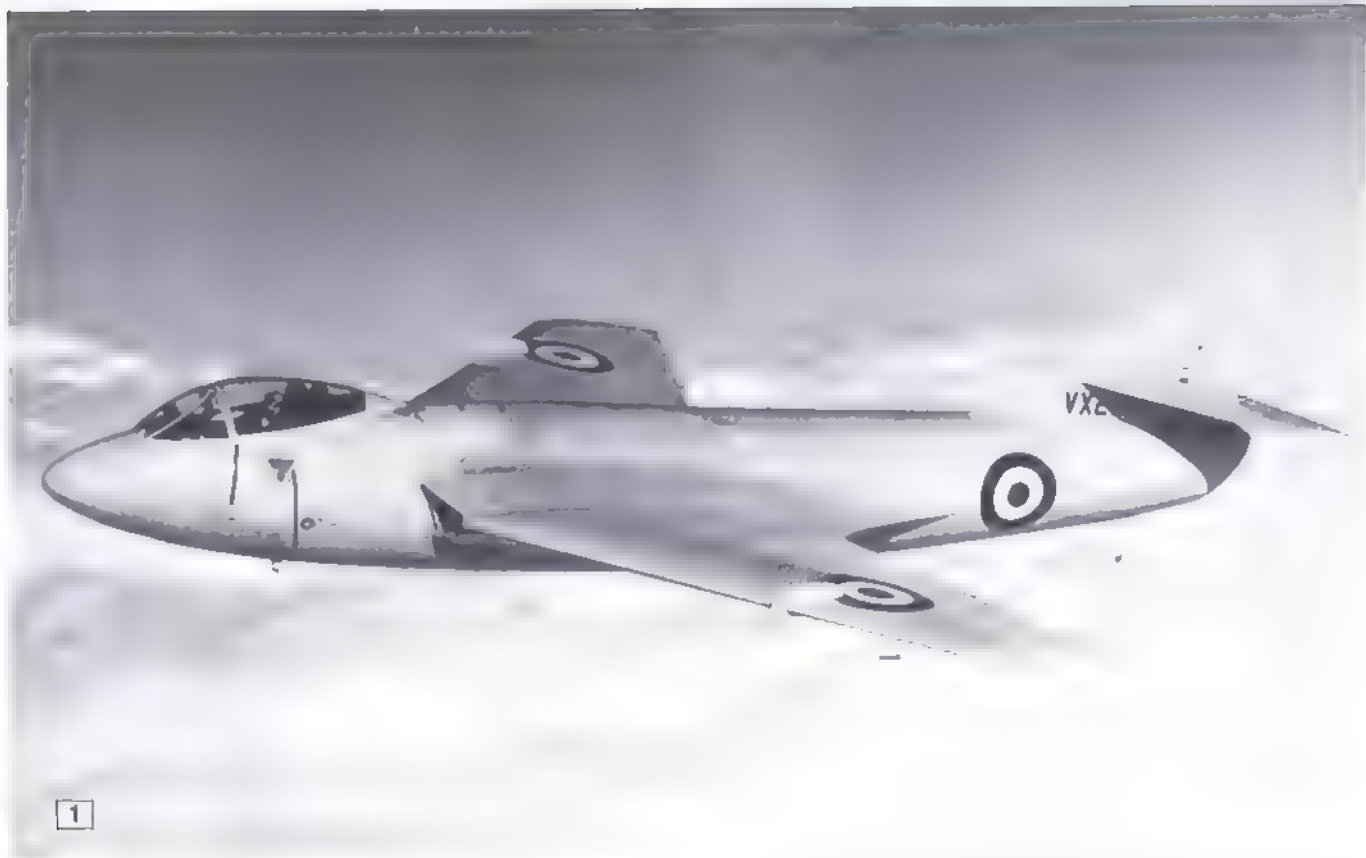
The bifurcated exhaust represented an Another black FRU aircraft was Mk.6 XE339 which served Airwork between 1965 and 1969. The Sea Hawk replaced the piston Hawker Sea Fury in FRU service and, in more recent times, these duties have been undertaken by another Kingston design, the Hunter. (MAP)

inversion of de Havilland practice on the Vampire. There a single conventional jet pipe was employed while the fuselage was split into twin booms which allowed the Vampire to enjoy an ease of engine access and removal far superior to the Sea Hawk. The latter's Nene had to be lifted out of the large plenum chamber covers. The bifurcat-

ed arrangement prevented the fitting of reheat as a future development for extra take-off thrust although methanol/water injection was suggested as an option. It did, however, make room available in the fuselage for fuel while blending of the wing and body helped the aerodynamics, cut down the structure weight and gave a deep wing root which provided space for the main wheels.

All 395gal. (1,796lit) of internal fuel (370gal. [1,682lit] in the original P.1040) was housed in the fuselage but provision came later for drop tanks under the inner wing. The original proposal for twin 75gal (341lit) drop tanks was replaced in August 1947 by 90gal (409lit) versions which needed a wind tunnel programme for clearance; the previous March a Nestable 100gal. (455lit) tank of oval section had been investigated and rejected.





1

Sea Hawk picture miscellany

1. What a swept wing Sea Hawk might have looked like. VX279 was a Hawker P.1052 being first flown on 13 April 1949. It was used by the company to investigate high speed flight on swept wings. 2. The prototype for the German Sea Hawk Mk.101 was XE456 seen here still in British markings. It was this aircraft that carried the first Ekco 38B search radar. The dome on the rear fuselage housed the aerial for a navigational aid. 3. The end of the road for Sea Hawk FB.3 WM965:104. It served with 898 Squadron before being placed in storage. 4. The FAA's sense of precision included the occasional showing off of the squadron aircraft in a line up. These FGA.6s belonged to 800 Squadron. 5. Another 800 Squadron Sea Hawk FGA.6 was XE365:103-O with rocket rails fitted.



2



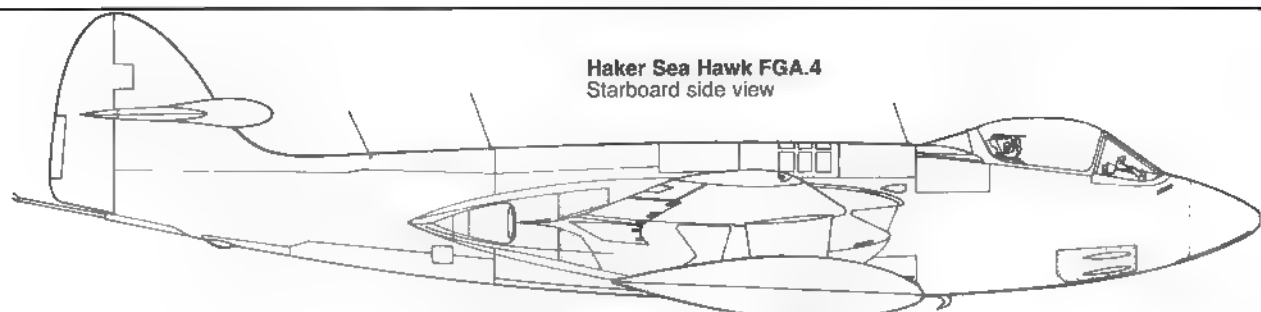
3



4

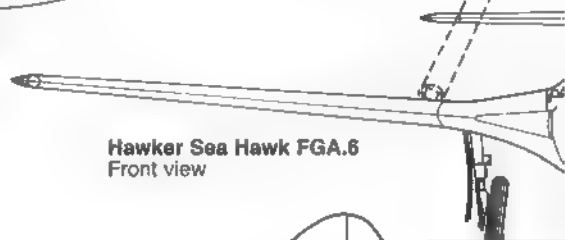


5

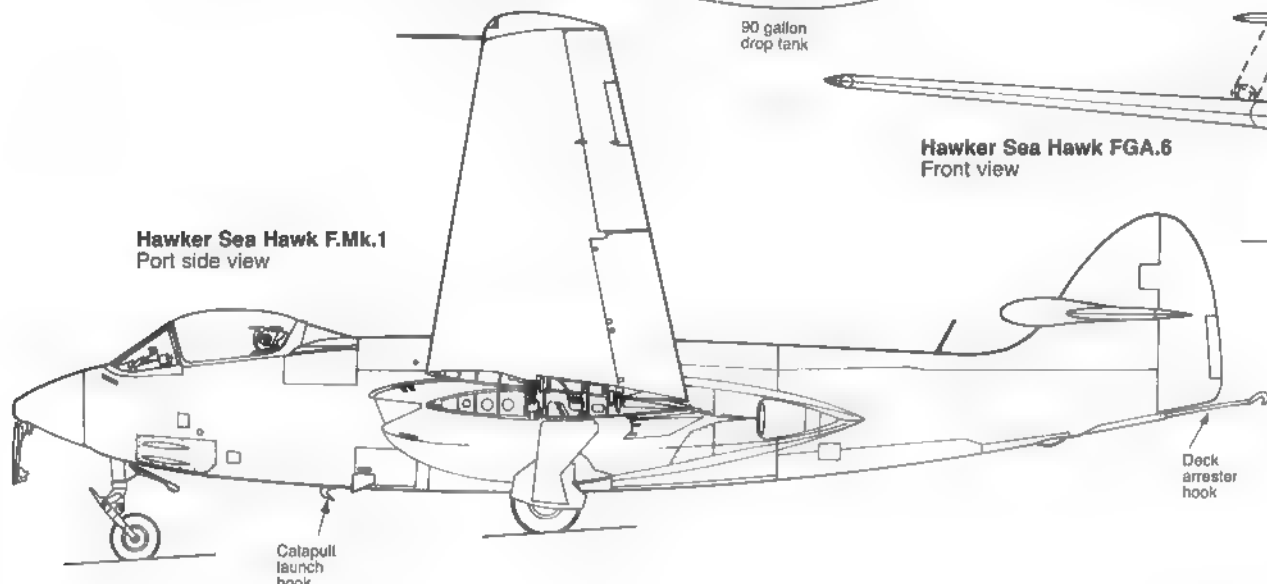


Hawker Sea Hawk FGA.4
Starboard side view

90 gallon
drop tank



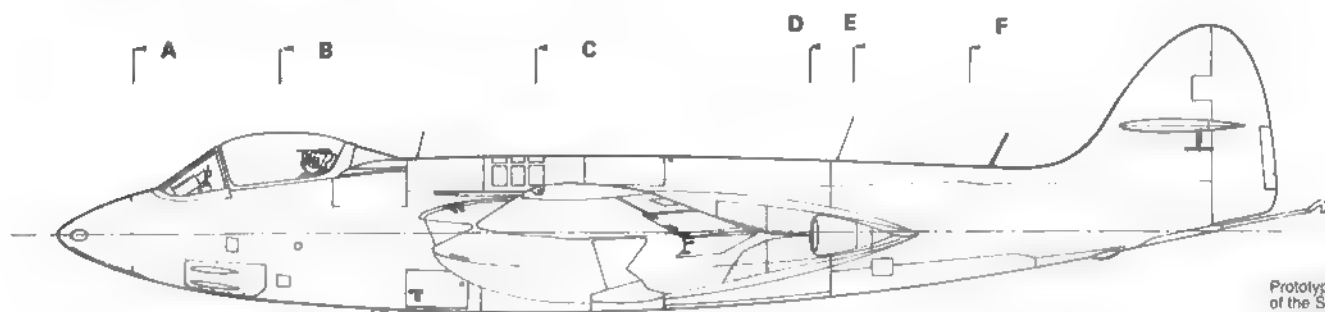
Hawker Sea Hawk FGA.6
Front view



Hawker Sea Hawk F.Mk.1
Port side view

Catapult
launch
hook

Deck
arrestor
hook

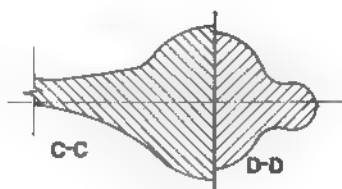


Hawker Sea Hawk F.Mk.1
Early version
Port side view

Prototypes and
of the Sea Hawk
not have the bu
the nose came
shaped attachm

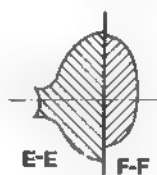


A-A
B-B



C-C
D-D

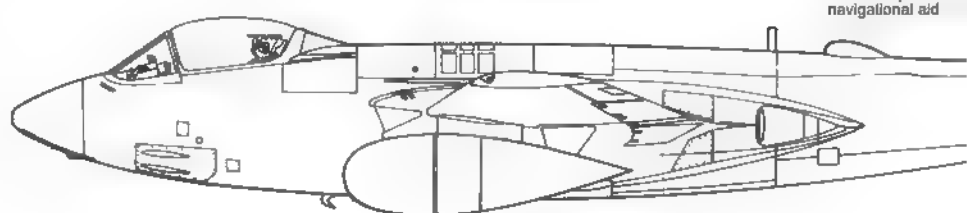
FUSELAGE CROSS SECTIONS



E-E
F-F

Hawker SEA HAWK

Hawker Sea Hawk Mk.101
Port side view



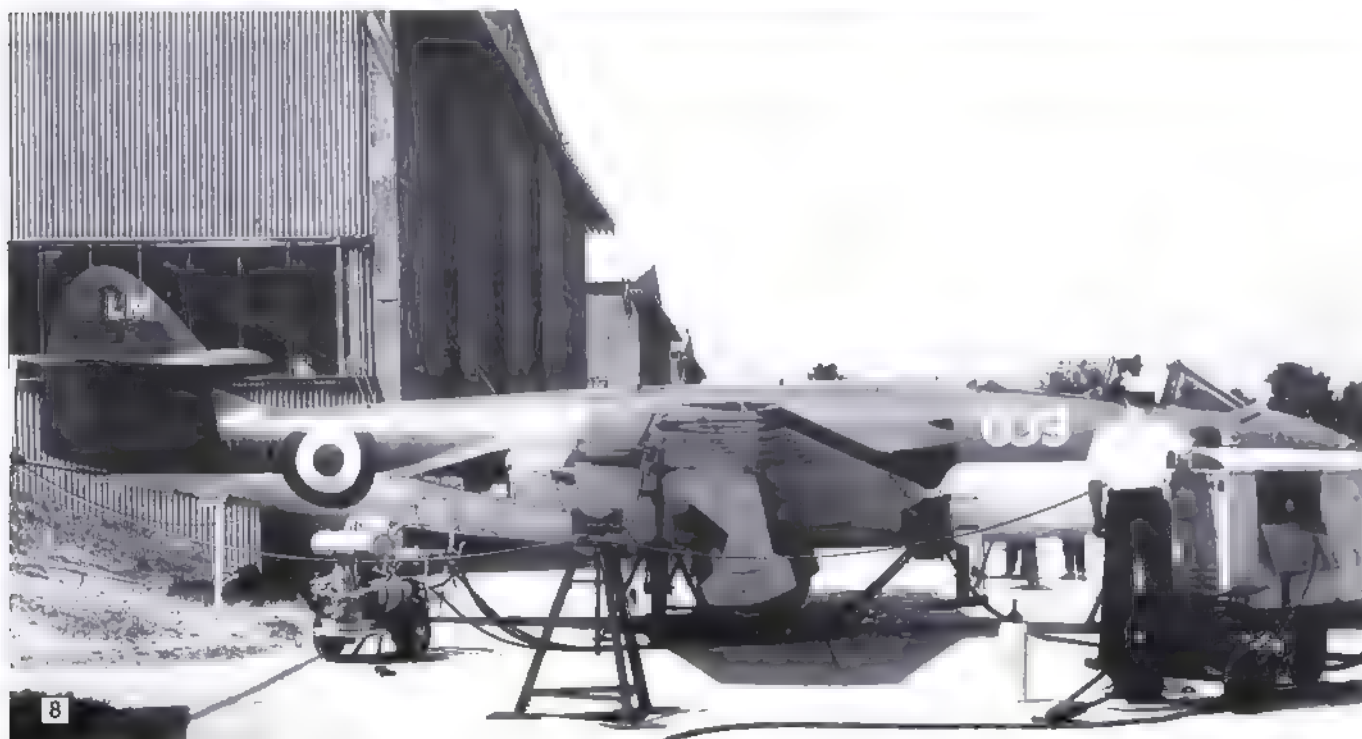
UHF aerial and
dome shaped
navigational aid

Ekco 388
radar in
starboard
side pod



Sea Hawk picture miscellany Page 2

6. Sea Hawks ashore. Several of 897 Squadron's FB.3s seen after their participation in the Suez Crisis, probably at Hal Far, Malta. They were attached to *HMS Eagle* during the Anglo-French operations. 7. Sea Hawk FB.3 WF280:699-FD of 764 Squadron based at RNAS Ford was part of the unit that eventually became the Advanced Weapons Training School in June 1957 and adopted the unusual nose badge shown in this picture. All of the later versions of the Sea Hawk were used at one time or another in this unit. (MAP). 8. This Lossiemouth Sea Hawk is probably WV833 or 836. It shows the final markings used on Sea Hawks and has been undergoing servicing at its home base in preparation for a test engine run.



Right: Sea Hawk Mk.6 XE372 seen with the TI Flight at Hal Far between July and December 1960. (Ray Sturtivant) Lower right: XE364 seen in 'museum hands' as '485' of 899 Squadron.

SIX RN VERSIONS

The main differences between the Sea Hawk F.Mk.1 and the N.7/46 prototypes were the presence of air brakes in the form of split trailing edge flaps, with the lower surfaces acting as landing flaps, plus the Nene 101 power unit offering a maximum 12,500rpm. When operated the upper split flaps rose 20 degrees while the lower were depressed by 30 degrees. Both ailerons and elevators became heavier at high indicated airspeeds. AWA's first Sea Hawk, F.Mk.1 WF162, was flown on 18 December 1952 by the firm's chief test pilot Eric Franklin and the increase in production rate saw the final Mk.1 fly in December 1953.

The F.Mk.2 was the first series version to get the power-assisted hydraulically operated ailerons with spring feel which improved high Mach number handling. AWA built 40 F.Mk.2 Sea Hawks with the first flying from Bitteswell in early January 1954; all were delivered by the end of March. The most numerous Sea Hawk, the F.Mk.3 development of the Mk.2, was adapted to carry twin 500lb (227kg) bombs or mines instead of the 90gal. (409lit) drop tanks. The Nene's lack of thrust meant the Sea Hawk was really more suited for ground attack work rather than the pure fighter role.

From mid-1953 Mk.1 WF157 was extensively tested by A&AEE with underwing bomb racks so turning it into the Mk.3 pro-

This attractive green and white colour scheme was applied to WV856 in early 1962 when it replaced XE390 as an 'Admiral's Barge' in the hands of No. 781 Squadron (the Joint Officers Air Course Unit) at Lee-on-Solent. It was used by Flag Officer Air (Home) [FOA(H)] and the scheme conformed to standard naval livery but with green substituting grey on the upper surfaces. WV856 stayed with the unit until July 1967 and is today preserved at Yeovilton. (Ray Sturtivant)



tototype. WF280 was the first production Mk.3 and flew on 18 March 1954, the mark also having powered ailerons but now with centring and spring feel. Mk.3 WM913 was evaluated in mid-1954 with a low-level F95 camera installed by A&AEE in the nose of a drop tank but the equipment, carried under the port wing instead of the standard tank and proposed for a reconnaissance fighter variant, was not taken into service. The last Mk.3 was WN119 delivered in September

1954. The demand for extra ground attack punch led to the 'four-store' configuration which proved effective but with yet more loss in performance. Mk.3 WF284 received modified outer wings with an extra pair of ordnance-carrying pylons and during mid-July 1954 was tested as an RP carrier while WF280 was adapted to carry four bombs. In this form WF284 effectively became the prototype for the FGA.Mk.4, the definitive ground attack Sea Hawk.





XE460, one of the last Sea Hawks built, is seen on airshow duty at Lee-on-Solent in June 1957. Note the black underwing bombs on this late mark's 'four-store' facility and the cannon laid out behind the nose wheel. (Air-Britain Colour Library)

The type could now deliver four 500lb (227kg) bombs or up to twenty 3in (7.6cm) RPs with 60lb (27kg) warheads but with this load aboard the Nene 101 lacked sufficient thrust to counter the considerable increase in drag, a disappointing situation when a clean Sea Hawk was little faster than a Gloster Meteor F.Mk.8. At this time Meteor 8s were being replaced by Hawker Hunters. In truth the Mk.4 was now just a short-range low level attack aircraft but, despite the criticism, the first, WV792, flew on 26 August 1954 and 97 examples were delivered by mid-March 1955. Mk.2, 3 and 4 all exhibited compressibility characteristics as per the F.Mk.1. During March 1956 WV840 was employed on flight refuelling trials with a Cumberra tanker for which refuelling probes were mounted on the front of standard finned drop tanks. These unfortunately proved unsuitable because longitudinal control was affected by drogue turbulence as the aircraft approached the drogue.

To counter the performance problem a new



Nene, the 5,200lb (23.1kN) thrust Mk.103, became available which improved the Mk.4's take-off and low speed handling performance but not the top speed. An effort to augment the latter and reach a Critical Mach Number of 0.87 involved the fitting of vortex generators to Mk.4 WV825, attached above and below the tailplane and elevators, but the flight results obtained in April 1955

Sea Hawk Mk.6 XE456 was used by Hawker Siddeley as a demonstration aircraft and never entered squadron service. It is seen with two underwing drop tanks, two 500lb (227kg) bombs and ten rocket projectiles. The rockets under the port wing have 25lb (11.3kg) warheads, those under the starboard wing 60lb (27.2kg) warheads. (Eric Morgan)

showed minimal improvement and the arrangement was not taken to production. This aircraft was test flown with a fully-powered elevator and electrically operated elevator trim between October 1956 and April 1957 but, despite improving control, this was also not included on series aircraft; the non-standard fittings were removed from WV825 when it was converted to Mk.6 standard the following autumn.

Sea Hawk FB.Mk.3 and FGA.Mk.4 aircraft which received the uprated Nene 103 were redesignated FB.Mk.5 and FGA.Mk.6 respectively and another 87 new-build Mk.6s were delivered between March 1955 and 10 January 1956. There were no new FB.Mk.5s so this concluded the Royal

Not all deck landings were successful. Sea Hawk FGA.Mk.6 XE488:126-C ended up taking the barrier when landing on HMS Centaur, actual date unknown. The ship's crane is being used to get the aircraft on its sea legs again watched by both officers and the deck handling party. (APN)



Navy's production and the line was dismantled. The Mk.6 received the Green Salad wide band UHF navigation aid, the first change to the avionics since production began. For a period from March 1955 an early Mk.1, WF145, was used to test the Green Salad homing system which was also fitted aboard Hawker Hunter and Blackburn Buccaneer aircraft.

In late 1955 AWA adapted Mk.6 XE456 as a trial long range fighter-bomber by adding extra drop tank stations on each wing outside the outermost bomb stations together with a fully automatic fuel transfer system. Trials with four standard Bristol finned plastic drop tanks and two 500lb (227kg) bombs began in January 1956 but, because of a poor take-off performance and difficulties with the transfer system, the result was not very successful and was abandoned from a British point of view the following July. However, this idea was eventually taken up by Germany as the Mk.100 and Mk.101 and XE456 was displayed as such at the 1956 Farnborough Show.

ROYAL NAVY SERVICE

As mentioned, No. 806 'Ace of Diamonds' Squadron became the first front-line operator of the 'Hawk', as it was known in the Fleet Air Arm, from March 1953. One of the unit's first duties was to take part in the fly-past that formed part of the Coronation Review of the Fleet at Spithead on 15 June. From 29 June to 2 July No. 806's Sea Hawks, together with other aircraft types, undertook successful full-scale 'angled deck' trials on the American Essex Class carrier *USS Antietam* which was newly fitted with an angled flight deck.

The angled deck was a new and important

The distinctive plumes of smoke given off by the Sea Hawk's cartridge starters, a sight much associated with this aeroplane. (B.J.Lowe)



Above: This picture of Mk.1 WF145 just after departure from *HMS Eagle* in May 1952 gives an excellent view of the bifurcated jet pipe. The drop used during the launch can be seen falling away into the sea. (Ray Williams) Below: This busy view of a Royal Navy carrier shows just how many people were involved at deck level with Sea Hawk launchings. (Alan Hall)





About to hook the arrestor wires of *HMS Ark Royal* is Mk.6 XE402 of No. 800 Squadron. The picture was shot in March 1956 and this aircraft was lost in September 1958 when it collided with Sea Venom XG620 during an anti-EOKA terrorist patrol over Cyprus.

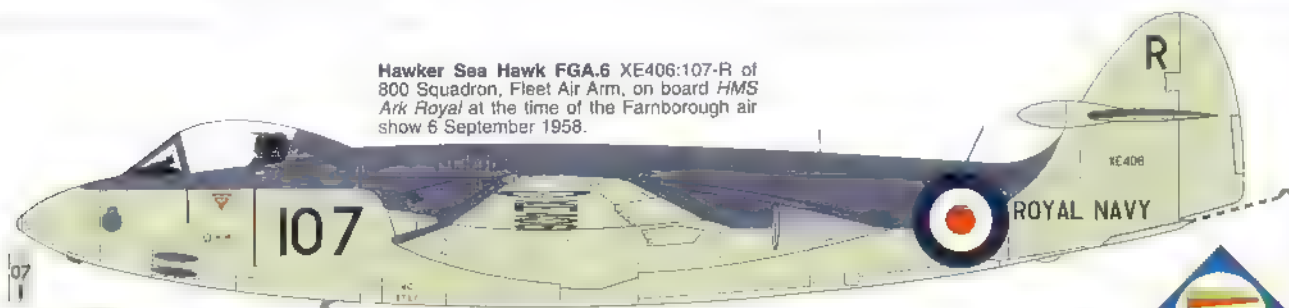
feature formulated in the wake of proposals for a flexible deck capable of landing undercarriageless fighters. A second deck on the same level as the original but slanted at about eight degrees with the end protruding over the port side would allow incoming aircraft to land within the extra length this provided while, at the same time, take-offs could continue over the bows from the conventional foredeck using the new steam catapult. This British idea was developed with American co-operation and the *USS Antietam* became the world's first angled-



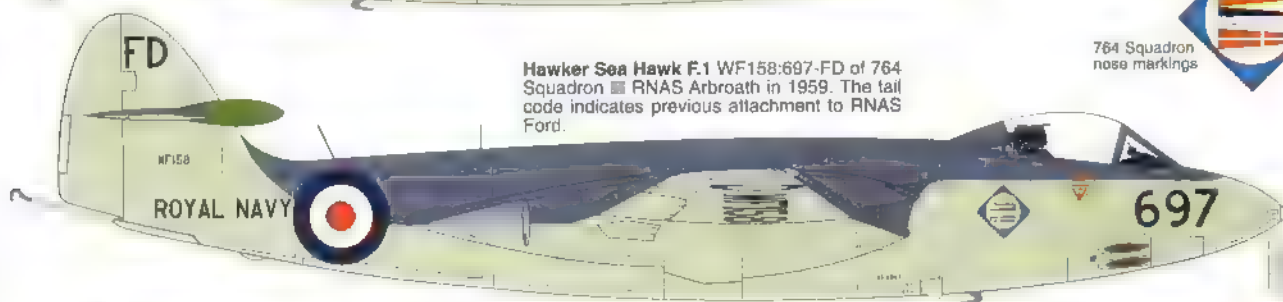
Above: WV865 in use by the School of Aircraft Handling. This aircraft served at Culdrose as 'SAH-7' in 1968-69 and is now preserved at the Luftwaffenmuseum in Germany. (MAP) Below: Proposals to give the Sea Hawk a flight refuelling capability saw Mk.4, WV840, carry a standard finned phenolic-asbestos underwing drop tank fitted with a probe. Trials with a Canberra tanker proved unsuccessful due to drogue turbulence problems. (Ray Williams)



Hawker Sea Hawk FGA.6 XE406:107-R of 800 Squadron, Fleet Air Arm, on board *HMS Ark Royal* at the time of the Farnborough air show 6 September 1958.



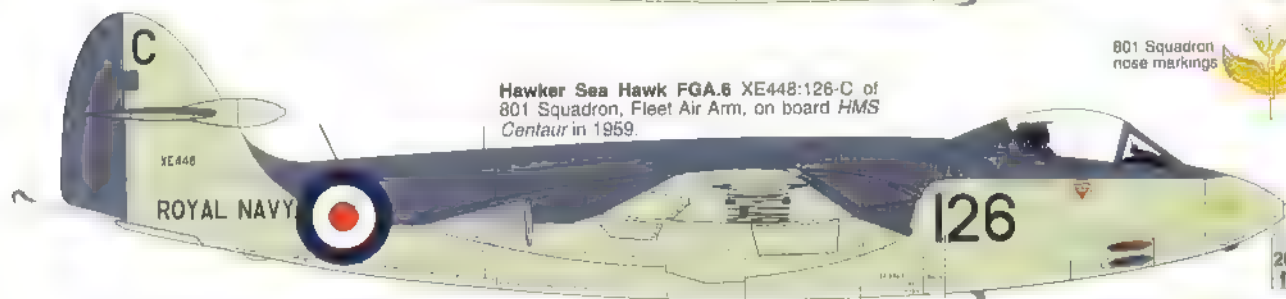
Hawker Sea Hawk F.1 WF158:697-FD of 764 Squadron ■ RNAS Arbroath in 1959. The tail code indicates previous attachment to RNAS Ford.



764 Squadron nose markings



Hawker Sea Hawk FGA.6 XE448:126-C of 801 Squadron, Fleet Air Arm, on board *HMS Centaur* in 1959.



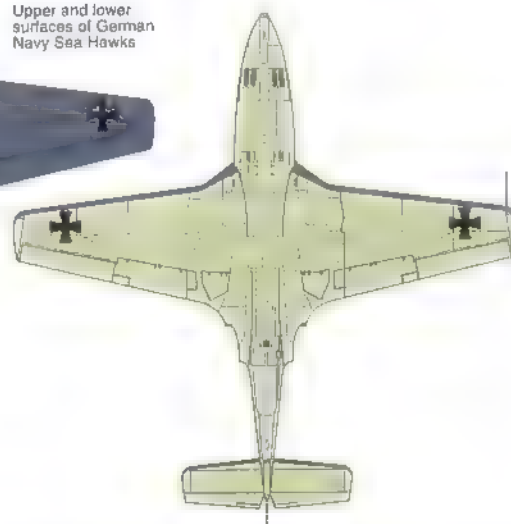
801 Squadron nose markings



Upper and lower surfaces of Indian Navy Sea Hawks



Upper and lower surfaces of German Navy Sea Hawks



flight-deck carrier because she was then under refit and was available for modification. The 1953 trials were conducted by the School of Aircraft Handling and comprised exhaustive take-offs and landings; the final report was very enthusiastic. Such was the success of the idea it was adopted for future large carriers world wide and proved vital for operating the much heavier aircraft that replaced the Sea Hawk. The Centaur Class received 5.5 degree angled decks while the rebuilt *Victorious* was the first British vessel to receive a fully angled deck, in 1957.

After working up at Brawdy, No. 806 began a Mediterranean cruise aboard *HMS Eagle* in early February 1954. The Sea Hawk had a tricycle undercarriage and so the very forward and vulnerable pilot location necessitated the introduction of a new type of carrier crash barrier to protect the cockpit in an emergency landing. However, the short, wide undercarriage enabled the machine to sit firmly on a carrier's deck. Other recipients of Mk.1 Sea Hawks were Nos. 804 and 898 Squadrons in 1953 and Nos. 802 and 807 in 1954. The second pair also began receiving F.Mk.2s in 1954, 807 taking the variant to sea on *HMS Bulwark* in February 1955, but the pure fighter Sea

Hawker Sea Hawk production

Type	No. built	Serials and remarks
P.1040 Prototype	(1 built):	VP401 built by Hawker Kingston
N.7/46 Prototypes	(2):	VP413, VP422 both built by Hawker Kingston
Sea Hawk F.Mk.1	(35):	WF143 to WF161, WF167 to WF177, WM901 to WM905 all built by Hawker Kingston
Sea Hawk F.Mk.1	(60):	All subsequent aircraft built by Armstrong Whitworth Coventry (Baginton) and Bitteswell; WF162 to WF166, WF178 to WF192, WF196 to WF235
Sea Hawk F.Mk.2	(40):	WF240 to WF279
Sea Hawk FB.Mk.3	(116):	WF280 to WF289, WF293 to WF303, WM906 to WM945, WM960 to WM999, WN105 to WN119
Sea Hawk FGA.Mk.4	(97):	WV792 to WV807, WV824 to WV871, WV902 to WV922, XE327 to XE338
Sea Hawk FB.Mk.5	(40+):	All modified from Mk.3 aircraft; includes WF281, WF286-7, WF296, WF299-300, WF302, WM906-7, WM913, WM926, WM928-9, WM931-2, WM934, WM936-7, WM939-40, WM942-3, WM961, WM965, WM968, WM972, WM974, WM983-4, WM987, WM989, WM992-4, WM998, WN107-8, WN115-7, WN119
Sea Hawk FGA.Mk.6	(87):	XE339 to XE344, XE362 to XE411, XE435 to XE463, XE489, XE490
Sea Hawk FGA.Mk.6	(76+):	All modified from Mk.4 aircraft; includes WV792-WV799, WV801-3, WV805-7, WV824-836, WV838-842, WV844, WV846, WV851-2, WV854-7, WV859-861, WV865, WV868-871, WV902-3, WV906-9, WV912-922, XE327-8, XE330-1, XE333-8
Sea Hawk FGA.Mk.50	(22):	For Royal Netherlands Navy; F-50 to F-71 - re-serialised 111 to 131 less F-53 lost in crash (also received Royal Navy serials XL237 to XL241, XL269 to XL275, XL305 to XL314 but not carried)
Sea Hawk Mk.100	(34):	For Marineflieger; VA+220 to VA+236, VB+120 to VB+136
Sea Hawk Mk.101	(34):	For Marineflieger; RB+240 to RB+256, RB+360 to RB+376
India	(60 second hand):	IN151 to IN159 (ex-RN WF301, WM985, WM995, WM977, WM923, WM978, WF293, WF297 and WM944 respectively), IN174 to IN180 (ex-RN WF281, WF300, WF302, WM928, WM929, WM940, WM989 not respectively), IN181 to IN196 (ex-RN XE378, XE458, XE383, XE394, XE362, XE397, XE333, WV907, WV844, WV832, XE335, XE372, XE367, WV793, WV859, WV871 respectively), IN230 to IN239 (all ex-German including VA+223, VA+225, VA+229, VA+230, VA+233, VA+235, VB+130, VB+131, VB+134), IN240 to IN257 (all ex-German including RB+242, RB+247, RB+251, RB+252, RB+255, RB+256, RB+369, RB+371, RB+372, RB+375) At least 7 more ex-RN machines acquired for spares or instructional duties.
Indian Sea Hawk	(14):	New-build by AWA; IN160 to IN173

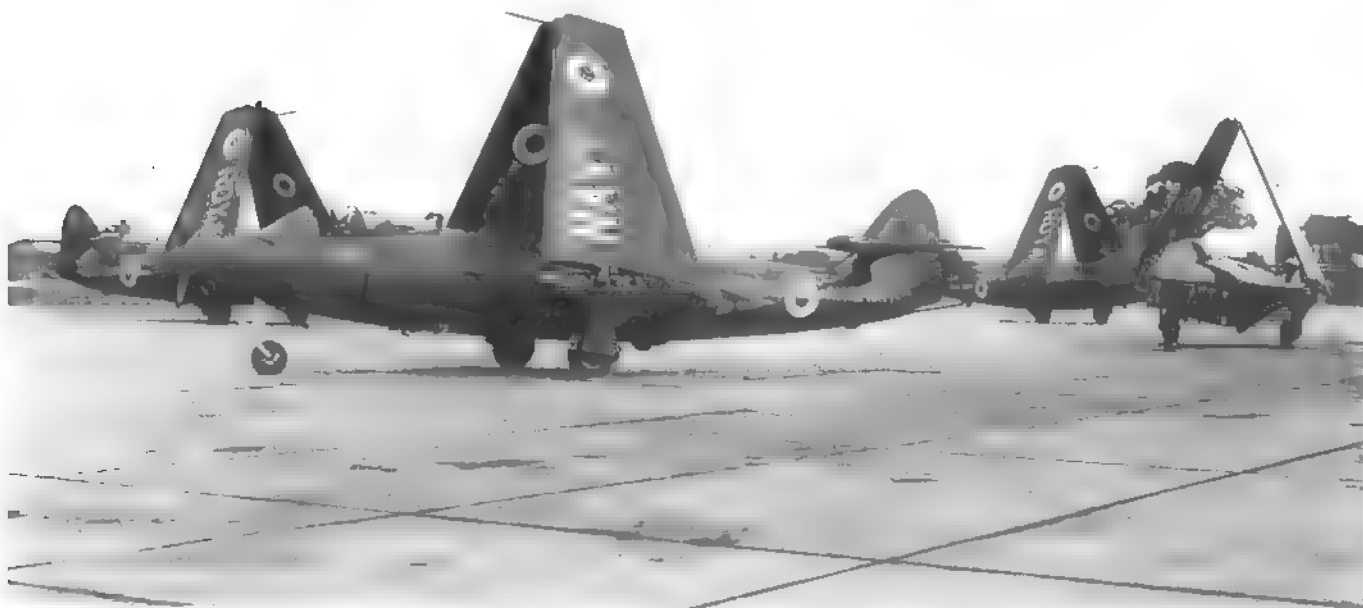
Hawks were removed from the front line by mid-1955 although they were employed for several years in training units such as Nos. 738 and 764 Squadrons. A few Mk.1 aircraft also stayed with FRU Hurn from 1956 to early 1958 (see below).

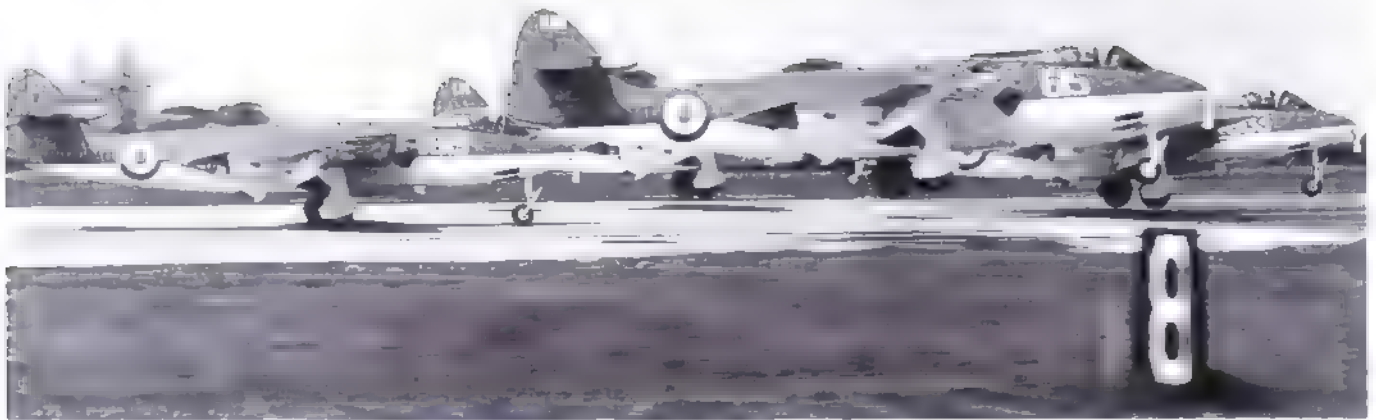
It was planned that three RNVR Squadrons, Nos. 1832, 1835 and 1836 and collectively known as the Southern Air Division, should receive Sea Hawk fighter marks as replacements for Attackers and Sea Furies but only 17 F.Mk.1 aircraft were supplied from January 1956 before disbandment of the RNVR's Air Branch in March 1957 as part of the defence cuts. The three units were all based at Benson and pooled their machines. When Cdr.(A) G. McC. Rutherford landed a Sea Hawk on *HMS Bulwark* in 1956, he became the first RNVR pilot to deck land a jet. Many F.Mk.1 Sea Hawks were cocooned after withdrawal but were then broken up in the 1958 to 1960 period.

The Mk.3 entered squadron service in July 1954, No. 806 again being the first recipient taking them to sea later in the month on *HMS Centaur*, and four more squadrons, Nos. 800, 803, 807 and 898, were converted or converting to the mark by the end of the year. Before 1954 was out Nos. 802 and 804, together with Nos. 801, 806, 807 and 811 Squadrons by March 1955, were also receiving the FGA.Mk.4. A progressive re-equipment with Nene 103-powered Mk.5 and Mk.6 aircraft was underway by mid-1955.

Replacement in front-line service began with the arrival of the first Supermarine Scimitars in June 1958, a real heavyweight aeroplane compared to the Sea Hawk, but the latter stayed in the front line until 15 December 1960 when the last squadron, No.

The Fleet Air Arm's aerobatic team 'Redhawks' from 738 Squadron even taxied in formation with their wings folded; scarlet paint was applied overall and they looked superb. (Ray Williams)

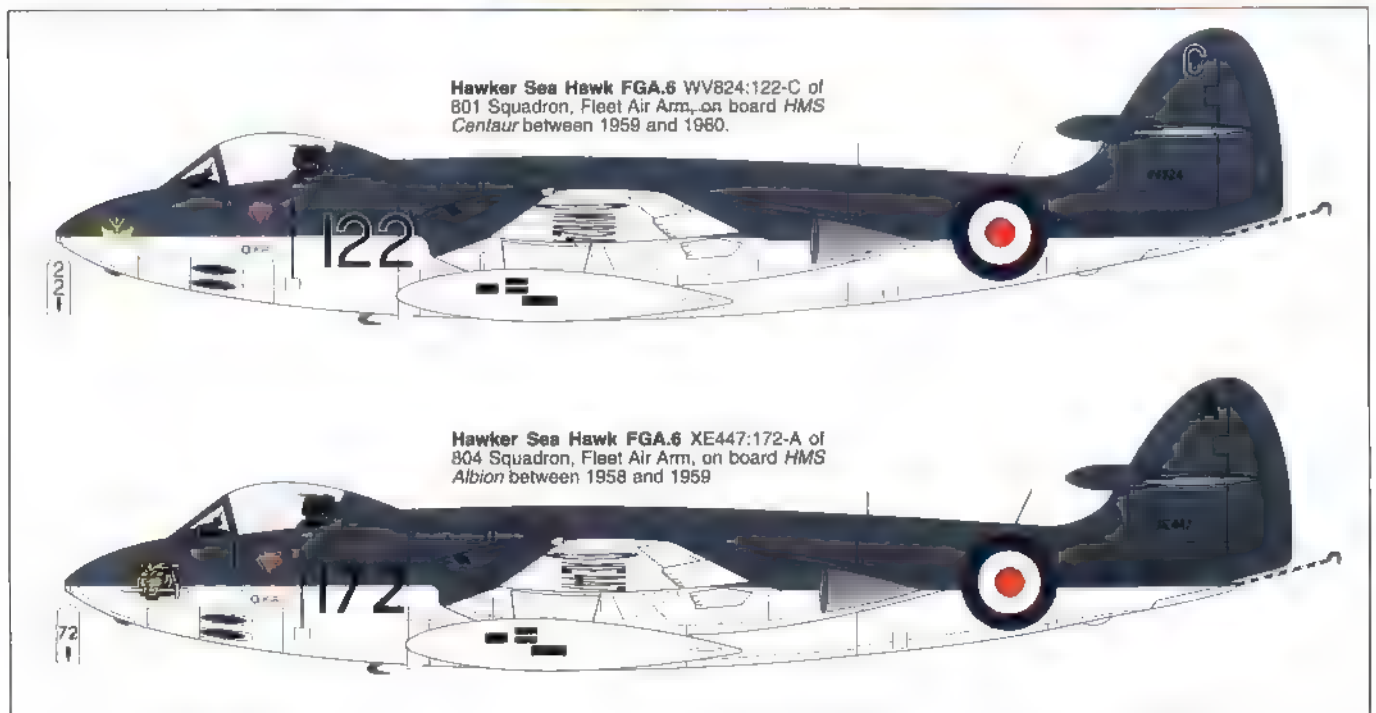




806, was disbanded at Brawdy after disembarking from *HMS Albion*. As the original operator this unit completed three months short of eight years with Sea Hawks on strength (No. 801 had kept its Hawks until July 1960). The Sea Hawk was always a popular aircraft with Navy pilots and, happily, the type continued performing second line duties for a further period. In the late 1950s the Naval Aircraft Radio Installation Unit (NARIU) at Lee-on-Solent received black-painted Sea Hawks with extra radar equipment aboard. Those late mark Sea Hawks not utilised for secondary duties were mostly scrapped in about 1963.

The most well-known secondary role was the Fleet Requirement Unit (FRU) at Hurn, Airwork Ltd's civilian pilots flying black-painted aircraft on various training duties on behalf of the RN; some of these aircraft also flew out of Hal Far in Malta and FRU spent some time at Lossiemouth. Its machines received a Harley light in the port underwing

Above: Four Sea Hawks of 738 Squadron's 'Redhawks' aerobatic team at Lossiemouth make a practice formation take-off. They have yet to receive their classic scarlet livery for their units famous displays of 1957. (MAP) Below: Another ex-738 Squadron Mk.6 aircraft WV836 '639' still with 738 codes, taken at Arbroath in July 1966. At the time it was serving as a ground instruction airframe A2545. (Air-Britain Colour Library)



Hawker Sea Hawk FGA.6 WV824:122-C of 801 Squadron, Fleet Air Arm, on board *HMS Centaur* between 1959 and 1960.

Hawker Sea Hawk FGA.6 XE447:172-A of 804 Squadron, Fleet Air Arm, on board *HMS Albion* between 1958 and 1959



Some of 804 Squadron's Sea Hawks seen with Westland Wyverns on *Eagle's* flight deck preparing for an operational rocket sortie during the Suez campaign. (MAP)

drop tank nose and were mainly used for radar training, either as targets for radar controlled guns on warships or for air direction training where trainee radar controllers could learn to vector an attacking aircraft on to a specific target, both 'attacker' and 'target' being Sea Hawks. Some aircraft were also used as target tugs. Withdrawal began in 1966 but the final examples, XE339 and XE390, lasted until February 1969, the last Sea Hawks to fly operationally in Britain.

A number of airframes then passed to the School of Aircraft Handling where they were employed to assist handlers in learning the techniques of manoeuvring aircraft on

carrier decks. These received SAH serials, ex-WV826 for example becoming SAH-2.

Others found work as ground instructional airframes but many surviving Sea Hawks were scrapped in the early 1970s having been stored or dumped, some in poor condition, at Abbotsinch, Ascot or Lasham.

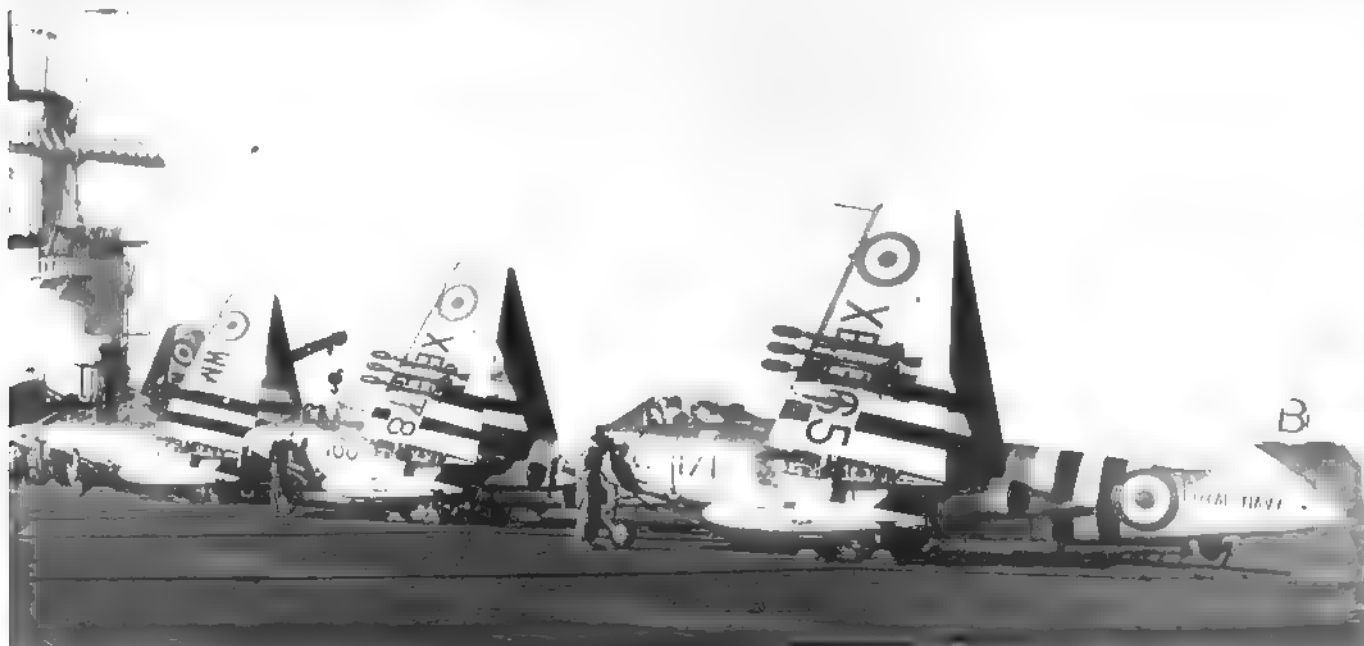
ACTION AND AEROBATICS

During the ill-fated Anglo-French attempt in November 1956 to force President Nasser of Egypt to back down from nationalising the Suez Canal (Operation 'Musketeer'), close support for British ground forces was provided by Royal Navy Sea Hawks escorted by de Havilland Sea Venom fighters. Despite the presence of more modern RAF Hawker Hunters at Cyprus these had no

clearance to deliver anything more than gun-fire support and they lacked low level range. For recognition purposes British and French aircraft received 'invasion stripes', either black and white or black and yellow.

Three RN carriers took part, all with Sea Hawks aboard - *Albion* (Nos. 800 and 802 Squadrons), *Bulwark* (804 and 810) and *Eagle* (897 and 899). On 1 November six days of rocket and bomb strafing attacks on Egyptian airfields and positions began using Sea Hawks, Sea Venoms and Westland Wyverns. The first Sea Hawk targets were Bilbeis, Abu Sueir and Cairo West. *Albion* also operated Sea Venoms, Skyraider AEW

Three 804 Squadron aircraft including XE365 and XE378 on the deck of *HMS Bulwark* during the Suez crisis. They are armed with 60lb (27.2kg) rocket projectiles. (Ray Williams)

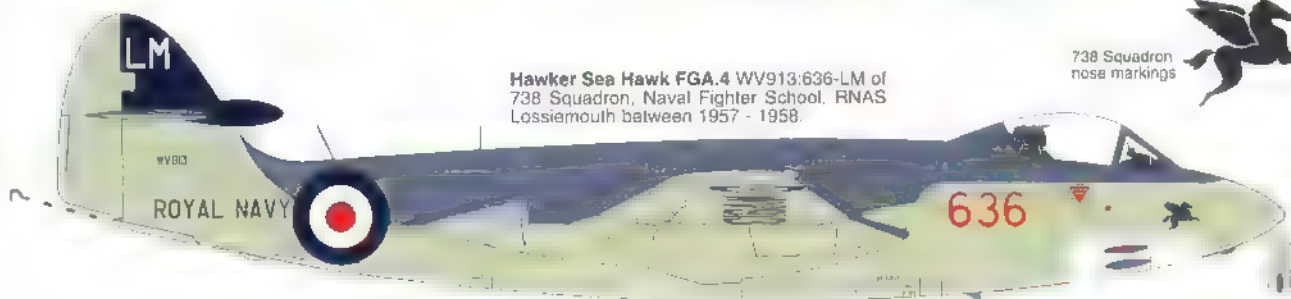


Hawker Sea Hawk FGA.6 XE390 of 781 Squadron, Fleet Air Arm, used as 'Admiral's Barge' for Flag Officer Naval Flying based at RNAS Yeovilton in the early 1960s.

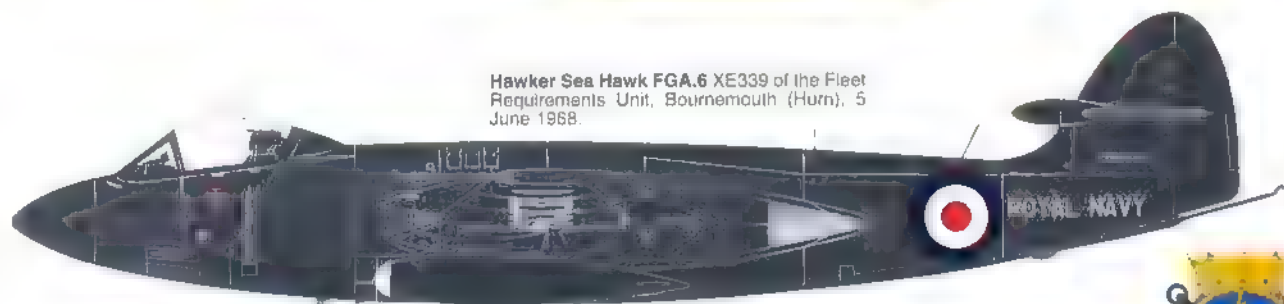


Hawker Sea Hawk FGA.4 WV913/636-LM of 738 Squadron, Naval Fighter School, RNAS Lossiemouth between 1957 - 1958.

738 Squadron
nose markings



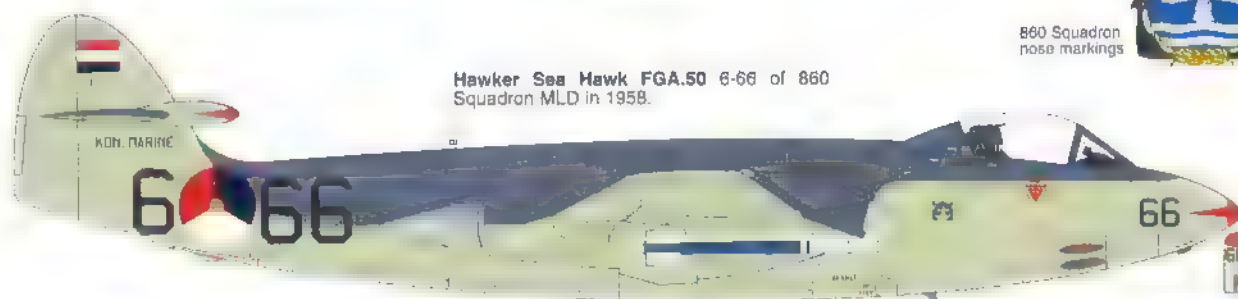
Hawker Sea Hawk FGA.6 XE339 of the Fleet Requirements Unit, Bournemouth (Hurn), 5 June 1968.



860 Squadron
nose markings



Hawker Sea Hawk FGA.50 6-66 of 860 Squadron MLD in 1958.



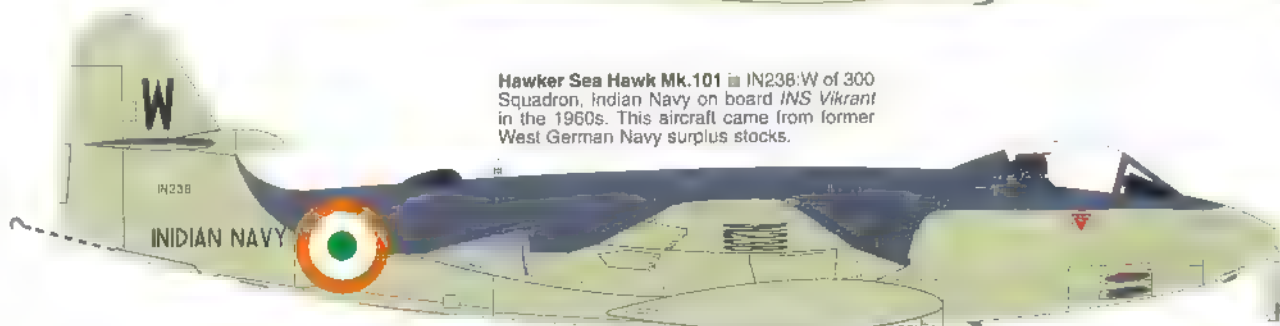
Marinefliegergruppe 2
nose markings



Hawker Sea Hawk Mk.101 RB-242 of MFG 2, West German Navy in the early 1960s.



Hawker Sea Hawk Mk.101 IN238-W of 300 Squadron, Indian Navy on board *INS Vikrant* in the 1960s. This aircraft came from former West German Navy surplus stocks.



Hawker Projects based on P.1040 and Sea Hawk

Project	Description and Date
P.1042	P.1040 variant, 1944.
P.1043	Undercarriageless P.1040 for flexible deck landing, 1944.
P.1045	Naval fighter P.1040 with AJ.54 engine, July 1945.
P.1046	Swept wing P.1040 with rocket boost, September 1945.
P.1047	Swept wing interceptor P.1040, B.41 plus rear fuselage rocket motor, September 1945.
P.1049	Fleet interceptor fighter with single AJ.65 and highly swept wings, January 1946.
P.1052	Experimental swept wing P.1040 with straight tail to Spec E.38/46. Two built, serials VX272, flown 19 November 1948, and VX279 flown 13 April 1949, used to collect high speed test data for swept wings. VX272 also made successful arrested deck landings aboard <i>HMS Eagle</i> in May 1952.
P.1062	Studies for swept wing P.1040 as interim interceptor, 1947-48. Main project had T-tail, all-through jetpipe and RB.44 Tay engine. Project led to P.1081.
P.1068	Straight wing variant of interim P.1062, the two forming a combined study based on results of P.1040 flight tests, March 1947. Powerplant and weapons identical to P.1062, wings and tail as per P.1040 but with all-through jet pipe.
P.1073	P.1062 variant, 1949.
P.1074	P.1040 with modified straight wing, 17 February 1949.
P.1075	P.1062 with reheated Nene, 16 February 1949.
P.1078	P.1052 with Screamer rocket motor and swept tail, 18 May 1951.
P.1080	P.1052 to Australian requirement, 1950.
P.1081	Modification of second P.1052 VX279 with swept tail and single jetpipe. First flown after rebuild 19 June 1950 but crashed 3 April 1951.
P.1087	Naval interceptor P.1081, 22 March 1951.
P.1094	P.1072 with four per cent thick wing, Nene plus Snarler rocket, 6 March 1952.

aircraft and Sycamore helicopters but the majority of sorties were made by Sea Hawks which flew continuously throughout the campaign. Despite a defective catapult, *HMS Eagle's* combined air group completed 621 sorties during these operations. On 2 November targets included the Huckstep

supply depot near Almaza where a Sea Hawk was damaged.

The type played a major part in eliminating much of Egypt's Air Force on the ground, thus reducing it to minor player status. During the initial attacks Bulwark's squadrons were credited with destroying 40



Egyptian aircraft on the ground and damaging over 60 more; four minor naval vessels were also sunk but there was a constant danger from heavy and accurate ground fire. Once the ground forces had landed on 5 November the Sea Hawks switched to providing ground support in the form of Cab-rank patrols from where they could be called down by land forces at short notice to raid specific targets. On 6 November No. 40 Commando was pinned down at Port Said

Examples of Renumbered FAA Sea Hawk Ground Instructional Airframes

F.Mk.1	WF143 as A2368 (St Merryn), WF200 as A2409 (FORA Worthy Down)
F.Mk.2	WF257 as A2462 (<i>HMS Ganges</i> , Shotley)
FB.Mk.3	WF294 as A2443 (Yeovilton), WM918 as A2489 and SAH-4 (Culdrose)
FGA.Mk.4	WV911 as A2526 (Lee-on Solent)
FB.Mk.5	WF299 as A2509 (Culdrose), WM937 as A2494 (Arbroath)
FGA.Mk.6	WV908 as 8154M (RAF Halton), XE327 as A2556 (Belfast)

Battle scarred WM995 of No. 802 Squadron lands aboard *HMS Albion* with its starboard fuel drop tank damaged by Egyptian ground fire. This aircraft eventually went to India as IN153. (MAP)





Sea Hawk WV834, an FGA.Mk.4 rebuilt to Mk.6 standard, was allocated to 700 Squadron as '515' when part of Yeovilton's Station Flight from February 1959 to June 1961. This shot shows some extra markings carried in 1961. (Ray Williams)

with No. 801 Squadron who's Mk.6 aircraft made several strikes against rebel tribes as part of Operation 'Damon'. India's Sea Hawks also saw some action which is described later.

One of Sea Hawk's very best qualities was its superb aerobatic capabilities. In 1954 No. 804 Squadron organised a seven-ship team which broke much new ground in the field of formation aerobatics and featured smoke canisters, formation take-offs and landings and a seven-aircraft loop. Even the start up was performed in unison with smoke columns pouring out of each machine when they fired their turbo-starter cartridges simultaneously. As a fitting grand finale for FAA Sea Hawk display teams, No. 738 Naval Training Squadron supplied a five-ship team for the 1957 SBAC Farnborough Show, each painted a vivid scarlet. Such was the ease of the aircraft's precision flying this group matched No. 804's earlier immaculate performances by taking-off and landing together 'as one' and employing smoke in close formation.

FOREIGN SERVICE

There was an attempt to interest Australia in buying the Sea Hawk because the country acquired a pair of ex-Royal Navy carriers in the late 1940s and early 1950s and needed aircraft to equip them. Several examples, including WF248, were loaded aboard *HMS Perseus* in April 1954 for evaluation and sale in Australia but the plan was never carried through and the aircraft were returned to Britain aboard *HMS Glory* the following October, having been held at Sembawang Aircraft Holding Unit from July. Australia eventually bought de Havilland Sea



Left: On 14 November 1956, just after the end of the Suez hostilities, XE375 '239' of 810 Squadron pulled out its hook when landing on *HMS Bulwark* and ditched overboard. This view almost certainly shows this incident. (Alan Hall)

by fire from the Egyptian Navy's HQ until Sea Hawks from the rank destroyed the buildings. However, a Hawk from *Albion* (XE400) and another from *Eagle* (XE377) were shot down on this day by ground fire while three more were damaged but were able to return safely to their carriers. After the cease-fire early on 7 November the carriers withdrew with their aircraft to Malta so ending the Royal Navy's biggest and most important combat deployment of the 1950s.

The Sea Hawk had proved to be an excellent ground attack aircraft and better in this role than when employed as an interceptor. The FAA's machines became involved in two further minor conflicts. First they were used on anti-EOKA terrorist patrols over Cyprus during the mid-1950s, and then in April 1960, *HMS Centaur* arrived at Aden



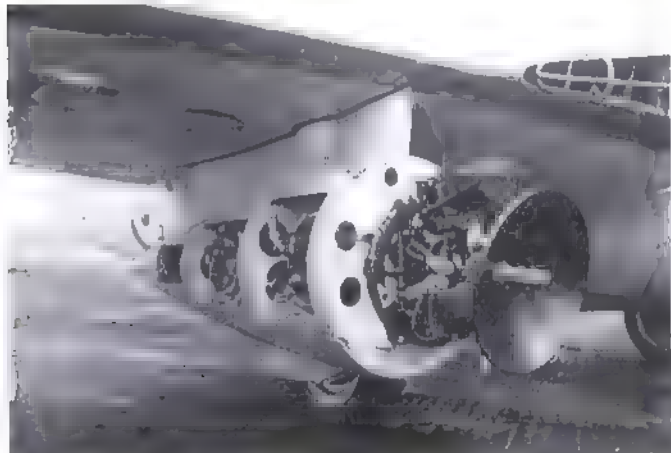
Right: VA-229, VA-230 and VA-231, seen here in 1958, were the last of 12 Mk.100 Sea Hawks to be delivered as complete aircraft, via Lossiemouth, to the West German Navy. The rest were assembled and flight tested by Focke-Wulf at Bremen. (Ray Williams)



Above: XE456 when first kitted out as a trial installation aircraft for the German Mk.101 with a mock-up radar pod on the outer underwing pylon. Photo date 22 June 1956. Above right: By 13 December 1956 XE456 had been fully rebuilt as the German prototype with a taller fin and it now carried the radar pod on the inner pylon.



Below, left and right: Close up details of the Ekco 38B search radar fitted on XE456; respectively radome and access covers in place and then removed. The German Mk.101 also carried a photo reconnaissance camera directly below in a fairing which had its own window in the bottom of the fuselage. (All Ray Williams)



Venoms. A Mk.2 Sea Hawk was also demonstrated to the French Navy on 12 April 1954 at Lann-Bihoué close to Lorient. France also acquired an ex-RN carrier but again no Hawk orders were forthcoming.

However, in 1956, some months after closing the Sea Hawk production line, AWA had to reopen it for the first of three substantial orders from overseas navies. The first came from the Royal Netherlands Naval Air Service (the Marine Luchtvaartdienst or MLD) for 22 FGA.Mk.6 aircraft paid for by NATO off-shore funding, the only change being the fitting of a Philips VHF radio with its large blade aerial visible on the amidships fuselage. As such they were known as the FGA.Mk.50 and all were delivered between 18 July 1957 and 29 January 1958. The main user was No. 860 Squadron based either at Valkenburg or aboard *HMNS Karel Doorman* (another ex-RN carrier); No. 3 Training Squadron at Valkenburg also received Sea Hawks with initial pilot training undertaken using the country's six Gloster Meteor T.Mk.7 aircraft.

From 1959 these machines broke new ground when, to supplement the guns, air-to-air guided missiles were carried for the first time in the form of two Philco Sidewinder IAs carried on the outer wing pylons. The Dutch Sea Hawks were withdrawn at the end of 1964 having never fired their weapons in anger but, curiously, their existence did prevent a possible conflict. Indonesia's planned full-scale attack on Dutch New Guinea in 1962 was halted because that country

Above and right: Two views of Marinellieger Sea Hawks in service: the upper shot shows VB+133 and RB+256 outside their hangars; the lower picture shows RB+248 again. (Both Luftwaffenmuseum)



Hawker P.1040, P.1072 and Sea Hawk

Technical Specification

Dimensions:

Span: P.1040 - 36ft 6in (11.13m), All Mk. Sea Hawk - 39ft 0in (11.89m).
 Folded Span: All Mk. - 13ft 3in (4.04m).
 Length: P.1040 - 37ft 7in (11.46m), F.Mk.1 - 40ft 0in (12.19m), FB.Mk.3 - 39ft 10.5in (12.15m), FGA.Mk.6 39ft 8in (12.09m).
 Wing Area: P.1040 - 256sq.ft (23.8sq.m), All Sea Hawks - 278sq.ft (25.8sq.m).
 Wing t/c ratio: 9.5 per cent.

Powerplant:

P.1040: Initially 1 x RR Nene RN.1 of 4,500lb (20kN) static thrust; later (with N.7/48 prototypes) 1 x RR Nene RN.2 of 5,000lb (22.2kN) thrust.
 F.Mk.1, F.Mk.2, FB.Mk.3 and FGA.Mk.4: 1 x RR Nene RN.4 (Mk.101) of 5,000lb (22.2kN) thrust.
 FB.Mk.5, FGA.Mk.6 and overseas Mk.s.: 1 x RR Nene Mk.103 of 5,200lb (23.1kN) thrust.
 P.1072: 1 x 5,000lb RN.2 plus 1 x AS Snarler rocket of 2,000lb (8.9kN) thrust.

Fuel Capacity:

Internal: P.1040: 370gal. (1,682lit), All Sea Hawks: 395gal. (1,796lit).
 External: FB.Mk.3 and 5: 180gal. (818lit) in two drop tanks, FGA.Mk.4 and 6: 360gal. (1,637lit) in four drop tanks.

Weights:

Basic Empty: P.1040 - 8,660lb (3,928kg), FB.Mk.3 - 9,187lb (4,167kg), FGA.Mk.6 - 9,278lb (4,209kg), P.1072 - 11,050lb (5,012kg).
 All-up-Weight: FB.Mk.3 clean - 13,225lb (5,999kg), FB.Mk.3 with drop tanks - 14,915lb (6,765kg), FGA.Mk.6 - 13,543lb (6,143kg), P.1072 - 14,050lb (6,373kg).
 Max. Overload: P.1040 - 11,200lb (5,080kg), FB.Mk.3 - 15,225lb (6,906kg), FGA.Mk.6 - 16,153lb (7,327kg).

Performance:

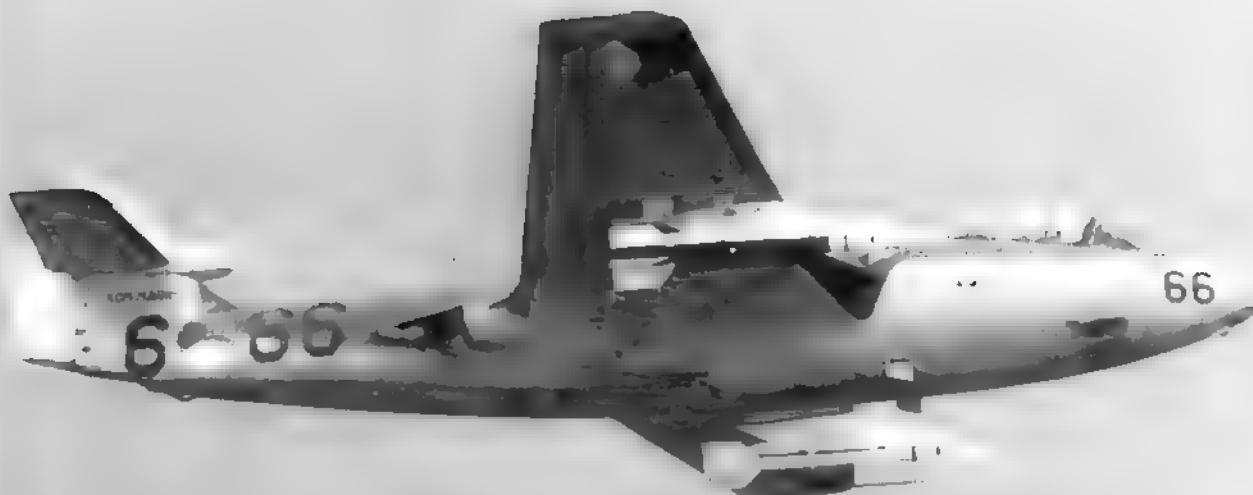
Max. Speed at Sea Level: P.1040 - 522kts (967km/h), FB.Mk.3 clean - 514kts (952km/h), with tanks - 505kts (936km/h), FGA.Mk.6 clean - 520kts (964km/h) (Mach 0.79), with two tanks and two 500lb (227kg) bombs - 450kts (834km/h) (Mach 0.68), P.1072 - 505kts (936km/h).
 Max. Speed at 20,000ft (6,096m): FGA.Mk.6 clean - 510kts (945km/h) (Mach 0.83).
 Max. Speed at 35,000ft (10,668m): FGA.Mk.6 with two tanks and two 500lb bombs - 455kts (843km/h) (Mach 0.77).
 Max. Speed at 40,000ft (12,192m): FGA.Mk.6 clean - 459kts (851km/h) (Mach 0.80).
 Max. Mach Number attained in level flight: P.1040 - 0.815, FB.Mk.3 clean - 0.823, with tanks - 0.80, FGA.Mk.6 clean - 0.83.
 Max. Mach Number attained in dive: P.1040 - 0.835, FB.Mk.3 clean - 0.85, with tanks - 0.821.
 Normal Endurance: P.1040 - 2hrs 18mins, FB.Mk.3 clean - 2hrs 15mins, with tanks - 3hrs 16mins.
 Sea Level Rate-of-Climb: FGA.Mk.6 clean - 5,700ft/min (1,738m/min), with two tanks and two 500lb bombs - 4,270ft/min (1,301m/min).
 Time to 35,000ft (10,668m): P.1040 - 12.4 mins, FB.Mk.3 clean - 12.5 mins, with tanks - 14.5 mins.
 Time to 50,000ft (15,240m) (predicted): P.1072 - 3.5 mins.
 Service Ceiling (rate of climb 500ft/min, 152m/min): P.1040 - 43,500ft (13,259m), FB.Mk.3 clean - 43,000ft (13,106m), with tanks - 41,000ft (12,497m), FGA.Mk.6 44,500ft (13,564m).
 Absolute Ceiling: P.1040 - 47,500ft (14,478m), FB.Mk.3 clean - 47,000ft (14,326m), with tanks - 45,300ft (13,807m).
 Radius of Action: FGA.Mk.6 (typical) - 288 miles (463km).

Armament:

P.1040: None fitted.
 F.Mk.1 and 2: 4 x fixed forward firing 20mm Hispano cannon in nose with 200 rounds per gun.
 FB.Mk.3 and 5: 4 x 20mm, provision to carry 3in or 5in (7.62 or 12.70cm) rocket projectiles or 1 x 500lb (227kg) bombs or mines or 2 x 90gal (409lit) drop tanks.
 FGA.Mk.4 and 6: 4 x 20mm, provision for up to 20 x 3in or 5in RPs or 4 x 500lb bombs or 4 x 90gal drop tanks.



German Sea Hawk Mk.101B8-248 on a flight over the land base. Note two drop tanks under each wing and the air intake on the upper rear fuselage. (Ray Williams)



Dutch Navy Sea Hawk F Mk.50 F-66 armed with two Sidewinder air-to-air missiles. (Royal Netherlands Navy Institute for Maritime History)

thought the *Karel Doorman* and her Sea Hawks had moved into the area when the ship was actually still in Rotterdam. The last year of service saw the creation of a Dutch Sea Hawk aerobatic team called the 'Sea Lords' which performed its first public display at Eelde on 13 June 1964.

Hot on the heels of the Dutch order came a much bigger one from the West German Navy, the only operator not to possess an aircraft carrier. A total of 68 were ordered in 1956, half as Mk.100 day interceptors and the rest as Mk.101 bad-weather reconnaissance types (i.e. not all-weather), a capability conferred by an Ekco 38B search radar carried in a special outsize underwing pod on the starboard inner pylon. This could comfortably detect ships through cloud and the German Sea Hawks also introduced a



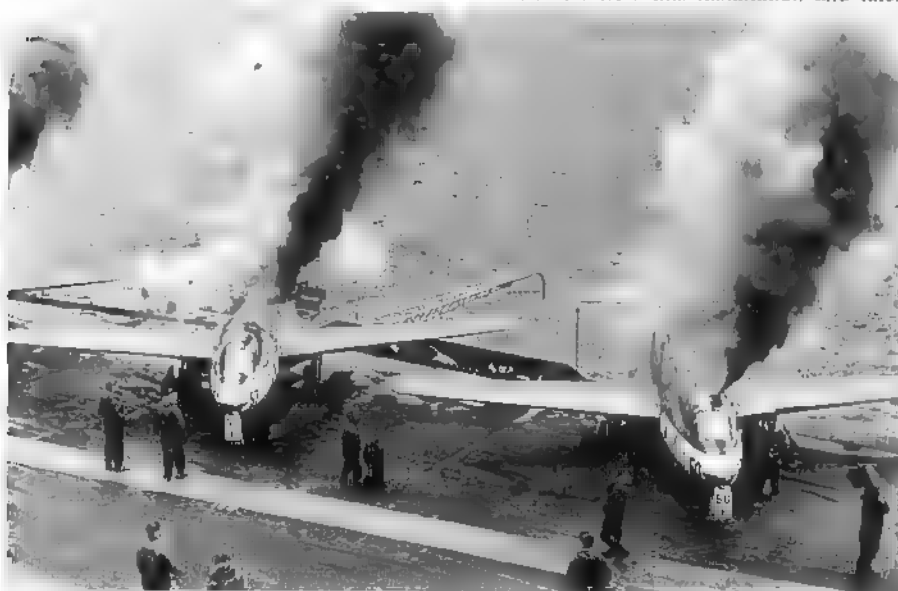
new taller vertical tail and rudder with an extra 12 per cent surface area. Both versions had UHF radio. This was the first time radar was carried by a Sea Hawk and, after completing its long range fighter-bomber trials, XE456 test flew this installation and later

The first Royal Netherlands Naval Air Service Sea Hawk F Mk.50, F-50, in clean condition. The principal change from the Fleet Air Arm's Mk.6 was the VHF radio blade aerial on the top of the rear fuselage. F-50 later received the serial 131. (Air-Britain)

the new fin between June 1956 and July 1957. However, in service the radar was of limited value since it quickly depleted the aircraft's electrical supply, so much so that the hydraulically powered ailerons had to be shut off during radar operation which did not help the pilot's ability to fly the aeroplane when he was concentrating on the radar screen.

Germany's Mk.100 aircraft also eventually acquired the capability to carry Sidewinder missiles on the outer pylons. The first Mk.100, VA+220, was delivered to Lossiemouth on 13 February 1958 and was followed by eleven more for the initial conversion of German personnel, but the remainder were assembled, flight tested, overhauled and repaired by Focke-Wulf at Bremen. This operation comprised a small rebuilt facility amidst the ruins of the much

Dutch Sea Hawk F Mk.50s F-50 and F-57 of 860 Squadron start their engines together on board *HMNS Karel Doorman*. (Ray Williams)



larger wartime factory and the last example arrived in Bremen on 21 April 1959. The type proved ideal for helping Germany's Marineflieger to re-establish itself and was a popular aircraft, the country's famous designer Kurt Tank praising it highly.

One German Sea Hawk pilot strayed by accident into East German airspace and, after circling for 15 minutes at 1,500ft (457m) to try and establish where he was, found he was being shot at by MiGs. As a counter he rapidly dropped to very low level and headed west but the opposition fighters continued to attack, fortunately unsuccessfully, until he crossed the border into West German airspace - a very lucky escape. After serving with two Squadrons, Marinefliegergruppe Mfg-1 and Mfg-2, these Sea Hawks were replaced by the Lockheed F-104G Starfighter in 1965. Most of the survivors were flown to Bremen and stored as surplus and for sale, but at least two, VA+220 and RB+245, survived until 1973 before being scrapped.

The third export order came from the Indian Navy who, at the time when the Royal Navy was retiring its Sea Hawks, acquired enough aircraft to equip two squadrons. Nine ex-RN FB.Mk.3s, rebuilt by AWA to FGA.Mk.6 standard, were ordered in May 1959 and delivered from 22 January 1960 onwards, the first, IN151 (ex-WF301) flying in converted form on 23 December 1959. Soon afterwards a further 14 new-build Mk.6s were requested and these, the last Sea Hawks to be built, made their maiden flights between 2 January and 20 July 1961. However, before they were completed, seven more refurbished ex-RN machines were also acquired. The last second-hand ex-RN Sea Hawks acquired for service use were 16 Mk.6s ordered and delivered in 1963-65 after refurbishing by Short Brothers at Sydenham; several of these were despatched still painted in black FRU livery. Several more ex-RN machines were supplied in 1961 and 1963 as spare

Brand new pristine Indian Navy Sea Hawk IN187 stands at Bitteswell before delivery. This aircraft made its maiden flight on 21 March 1961; it was delivered to Yeovilton on 27 April and then embarked on *INS Vikrant* in July for its trip to India. This was one of the very last Sea Hawks to be built. (Ray Williams)



Above: Indian Sea Hawk IN193 was the former FAA XE367 and first flew on 27 October 1964 after refurbishing by Shorts at Sydenham; it was delivered in November. Prior to its sale XE367, like many ex-FAA machines acquired by India, had been placed in Long Term Storage. (APN) **Below:** Black Sea Hawk IN192 (ex-XE372) of No. 300 Squadron was delivered to India in November 1964. Note the white drop tanks - such aircraft in UK service usually had black tanks. (MAP)



parts or ground instructional airframes.

In 1966, ten Mk.100s were acquired from Germany as attrition replacements together with 18 Mk.101s. These were ordered in August 1965 through a German arms dealer but were embargoed a month later after the first Indo/Pakistan conflict and this stayed in force until June 1966. Eventually the aircraft arrived in India via sale to a third party in Italy and were delivered in a single consignment aboard the cargo ship *SS Billetal*.

The main recipient of India's Sea Hawks was No. 300 'White Tiger' Squadron (INAS 300) which commissioned on 6 July 1960 at RNAS Brawdy, Indian air and groundcrew

having been based there for three months for conversion training. This unit first embarked on *INS Vikrant*, another former RN carrier, in summer 1961. The other operator was INAS 551 which was based for a period at *INS Hansa* in Goa. About 50 Sea Hawks were still active by the late 1970s and the last of them was withdrawn from service in 1984, almost 40 years after project work began on the P.1040 at Claremont and over 30 years after service entry with the Fleet Air Arm. No mark number was ever allocated to India's aeroplanes and they were replaced by another Kingston product, the

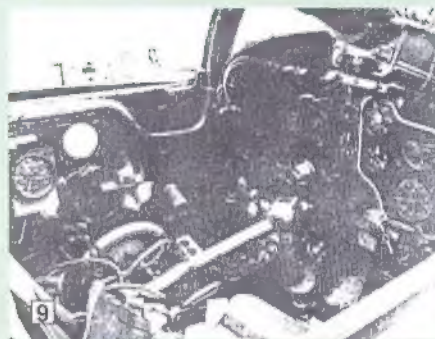
Continued on page 40





1. Nose close up of an 806 Squadron aircraft. Note the open access panel and, unusually the squadron commander's and crew chief's names. (Eric Morgan). 2. Nosewheel door close up shows a small identification light. 3. Port side fuselage with detail of the small inlet each side of the windscreen. 4. WV797's tail unit featuring the arrestor hook and the amount of overlap of the upper surface colours on the tailplane. 5. Undercarriage doors, wing underside and port jet orifice in WV797.





Sea Hawk in detail

Most of the photographs in this feature have been taken by the author and are of Sea Hawk WV797 in the Midland Aircraft Museum, Baginton, Coventry

6. The fuselage upper surface somewhat dilapidated through outside storage. The six panels on the fuselage allow extra air into the engine when needed. 7. The underside of the port side of the fuselage with the panel and gun troughs forward and the cartridge ejection chute a short way behind. 8. Port side forward fuselage with prominent marker lines to indicate the entry steps. The canopy is interesting as the frame is in Extra Dark Sea Grey suggesting that it might have come from another aircraft with the final Sea Hawk colour scheme. 9. Cockpit interior of a Mk.101 Sea Hawk. Trim wheel close to the throttle lower left, blind flying panel centre and the fighter-type control column having various buttons attached for trim, armament and radio. 10. Sea Hawk wing fold on the example in the Malta Aviation Museum. The later versions had power folding for the wings unlike the Mk.1 to Mk.4 where eight men were needed to either open or fold the wings. (A.W.Hall)





Continued from page 37

Sea Harrier.

INAS 300's aircraft were active during the two Indo-Pakistan wars of 1965 and 1971, particularly so in the second conflict over East Bengal where they flew 200 sorties. On 4 December 1971 eight Sea Hawks left *Vikrant* in the Bay of Bengal to strike Chittagong's harbour and airfield with rockets and bombs. On 5 December Chittagong, Cox's Bazaar and several ships were attacked by Sea Hawks, on the 6th the airfields and harbours of Dohazari, Hathlahazari, Chittagong, Khulna, Chalna and Mangla all received attention and on the 8th, 10th and 11th, Chittagong was again hit and Cox's Bazaar airfield put out of action. Thirty more ground attack sorties followed on 12 December, when one Sea Hawk received severe damage from anti-aircraft fire over Chittagong but managed to return to *Vikrant*, before Pakistan's eastern forces surrendered on the 16th.

A DELIGHT TO FLY

The great majority of pilots considered the Sea Hawk a delightful aeroplane to fly which handled superbly. This made it a good weapons platform and ideal for its later roles. It was also surprisingly agile, principally through its lightly loaded wing which conferred a good instantaneous turn performance but with a sustained turn rate of poorer quality. The machine proved to be an excellent 'first jet' for Hawker Aircraft and, thanks to its manoeuvrability and straight wing performance, it outclassed both the Gloster Ace and Supermarine's Attacker, each powered by the same single Nene powerplant, to be one of the best first generation jet-powered combat aircraft.

The Sea Hawk has often been described as a 'pilot's aeroplane' because of this ease of flying and perhaps this was one reason why the Fleet Air Arm never pushed too hard for a two-seater. AVM George Black has written 'A flyer was given the Pilot's Notes to read, then an experienced pilot supervised the cockpit checks, including the engine start, and ... it was time for the first familiarisation flight'. Its handling and lovely stability made it an ideal carrier aeroplane, especially for the approach to a deck landing.

Few aircraft were as glamorous as the Hawker Hunter but, in true Hawker tradition, the Sea Hawk too was a graceful and pretty aeroplane. Ralph Hooper, who was

heavily involved on all Kingston's aircraft from the Hunter to the HS.1182 Hawk trainer, has stated that it was 'a pity the Sea Hawk was not re-engined with the Rolls-Royce Tay of 20 per cent higher thrust, as the basic aircraft came to be regarded as rather low-powered as a fighter and, in fact, was operated for most of its service career as a ground attack aircraft, in which role it excelled'. There is strong opinion that more powerful engines would have benefited the Sea Hawk above 30,000ft (9,144m), but the original aeroplane was turned from a 'pure' fighter, designed to defend its carrier and escort group and other carrier group aircraft from attack, into a successful fighter bomber and ground attack machine.

Sea Hawk production totalled 539 plus the three prototypes and a good number of rebuilds for overseas. The aircraft was a simple and entirely conventional design that was straight-forward to service and maintain; in fact this simplicity was even greater than some previous piston types, its straight wing for example was easier to manufacture than the elliptical wing of its most immediate ancestor, the Sea Fury. In truth, without radar or missiles, Sea Hawk was little more than a World War 2 fighter with a jet engine, yet it did not enter service until 1953.

Its front-line Fleet Air Arm service lasted

Sea Hawk XE364:485-J was restored for display at the Southend Aviation Museum. No squadron markings were shown but it did have the Suez crisis yellow and black markings on the wings and rear fuselage. (APN)

a mere eight years although it continued as a target facilities aircraft for a further eight. Today a 16 year career seems negligible but for a first-generation jet fighter in the 1950s it was a fine achievement after a relatively late service entry. However, the extended service given to the type by the Indian Navy pushed this figure beyond 30 years, an extraordinary statistic. Some published sources have suggested that a development of the swept wing P.1052 (essentially a P.1040 with swept wings) should have been put into production instead of the Sea Hawk which, for the time, would seem a wholly logical argument. But who might have imagined then that the original straight wing would serve until the 1980s?

The Sea Hawk has been well served by preservation groups, probably the best known example being WV908 which flew as a member of the Royal Navy's Historic Flight between 1978 and 1995. A second machine is being restored for flight in Minneapolis and several more are held in British museums. WM969 is currently at Duxford, WV797 at Baginton, WM913 at Newark, WV798 at Lasham, XE368 at Helston (Cornwall), WV856 at the FAA Museum, Yeovil, XE340 at Montrose, WF259 at East Fortune, WM961 at Caernarfon and WN108 (painted black) at Langford Lodge in Ulster. Overseas survivors include WV865 presented to the Luftwaffenmuseum near Berlin, VA+234 at Jagel, VB+136 at Murwik and RB+363 at Eggebek, WV828 (repainted as Dutch 118) in Amsterdam, IN234 (ex-German VA+233) in India and WV826 in the Aviation Museum, Malta.

The end of the line. Sea Hawk WF186 in storage at Anthorn having spent its last active days at Brawdy. A number of the aircraft in this store were refurbished for sale to other countries.



Sea Hawk kits, decals and accessories

Scale	Type	Manufacturer	Reference	Remarks
1:144	Sea Hawk	Welsh Models	WHPJW14	Complete multi-media kit
1:72	Sea Hawk	Airfix	2097	Part of Historic Flight kit
1:72	Sea Hawk	Chematic	72328	Ex-Frog kit
1:72	Sea Hawk	Model Art Decals	7213	Contains Sea Hawk markings
1:72	Sea Hawk	Model Art Decals	7226	Contains Sea Hawk markings
1:72	Sea Hawk	Novo	328	Original Frog kit
1:72	Sea Hawk	Modeldecals	018	Contains Sea Hawk markings
1:72	Sea Hawk	Modeldecals	057	Contains Sea Hawk markings
1:48	Sea Hawk	Falcon	408	Vacuum kit

Not all of these kits might still be on the market. Contact an international stockist to find availability.



807 Squadron
nose markings

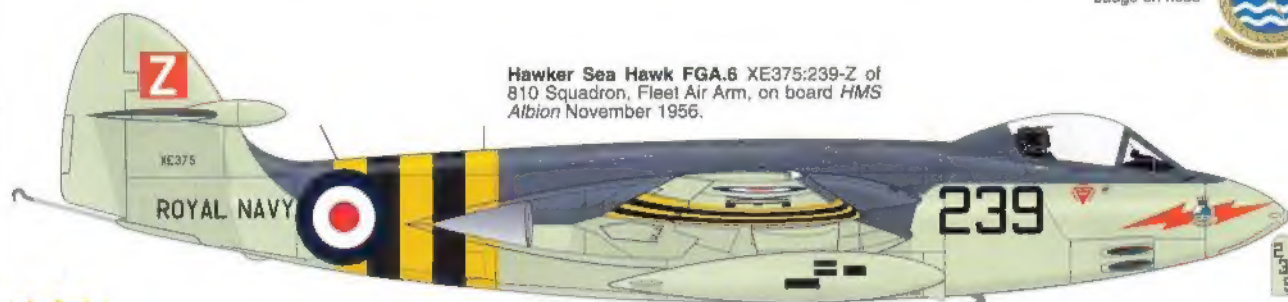
Hawker Sea Hawk F.2 WF254:121 of 807
Squadron, Fleet Air Arm, in 1954.



810 Squadron
badge on nose

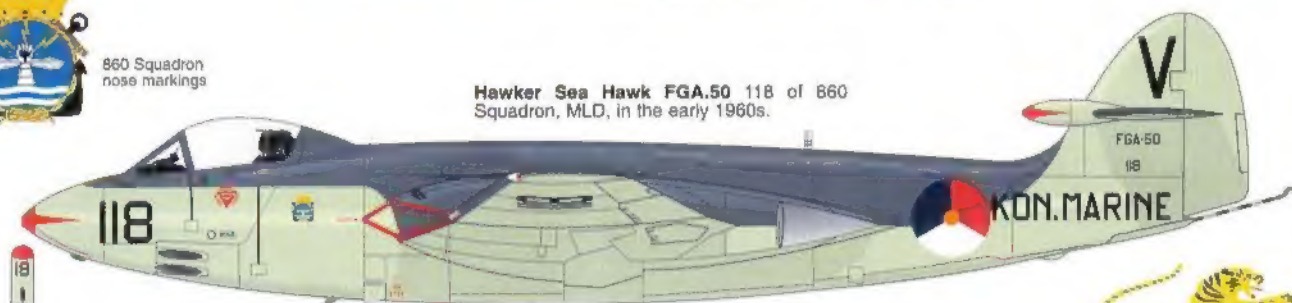


Hawker Sea Hawk FGA.6 XE375:239-Z of
810 Squadron, Fleet Air Arm, on board *HMS*
Albion November 1956.



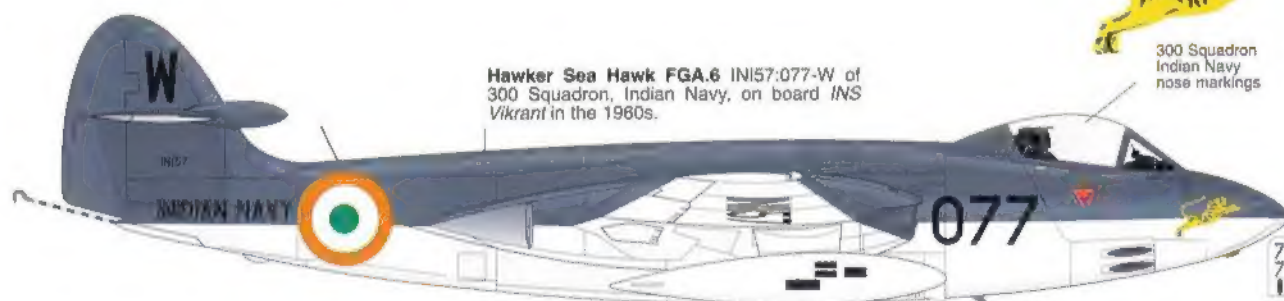
860 Squadron
nose markings

Hawker Sea Hawk FGA.50 118 of 860
Squadron, MLD, in the early 1960s.

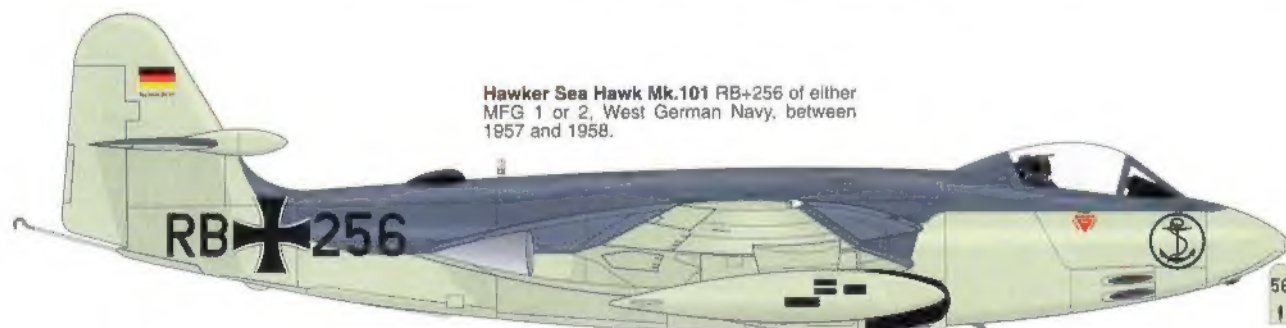


300 Squadron
Indian Navy
nose markings

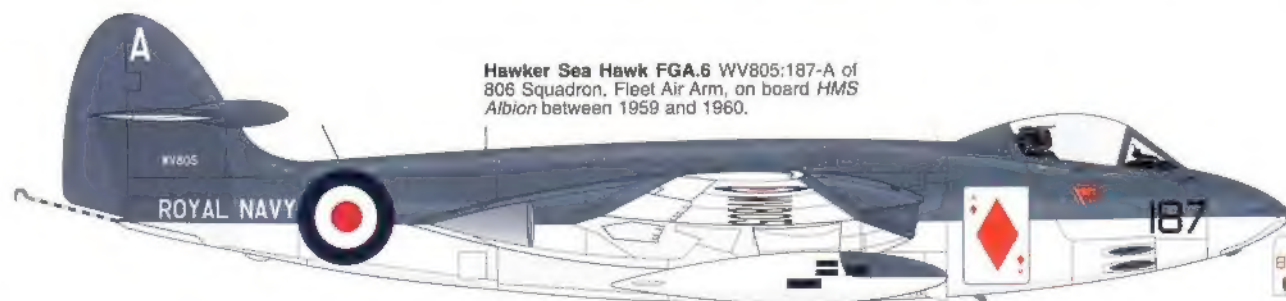
Hawker Sea Hawk FGA.6 IN157:077-W of
300 Squadron, Indian Navy, on board *INS*
Vikrant in the 1960s.



Hawker Sea Hawk Mk.101 RB+256 of either
MFG 1 or 2, West German Navy, between
1957 and 1958.



Hawker Sea Hawk FGA.6 WV805:187-A of
806 Squadron, Fleet Air Arm, on board *HMS*
Albion between 1959 and 1960.





Above: The same Sea Hawk, WV908, that appears on the front cover in the markings of 806 'Ace of Diamonds' Squadron. It was restored for display purposes with the Fleet Air Arm's Historic Flight based at Yeovilton.



One of a number of Sea Hawk restorations to full flying condition was undertaken by the Jet Heritage historic aircraft collection at Bournemouth (Hurn) airport. It was appropriately civil registered as G-SEAH and these two pictures were taken at its rollout in 1986. (A.W.Hall)



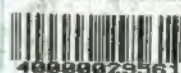
OTHER TITLES IN THE WARPAINT SERIES

Bristol Beaufighter £6.95, Blackburn Buccaneer £7.50, Junkers Ju 87 Stuka £7.50, F-100 Super Sabre £7.50, Hawker Typhoon £7.50, Avro Shackleton £7.50, Junkers Ju 88 £7.50, Hawker Hunter £11.50, Grumman F4F Martlet/Wildcat £7.50, Vickers Wellington £7.50, DH Sea Vixen £7.50, Fairey Swordfish £8.50, Fw 200 Condor £7.50, BAC Lightning £11.50, Short Stirling £7.50, Hawker Sea Fury £7.50, Gloster Javelin £9.50, Douglas Skyraider £8.50, DH Hornet and Sea Hornet £9.50, Supermarine Seafire (Griffon engined variants) £9.50, Armstrong Whitworth Whitley £8.50, Gloster Meteor £16.50, Fairey Gannet £8.50, Dornier Do 217 £8.50, Short Sunderland £9.50, Bristol Blenheim £9.50, de Havilland Vampire £16.50, Fairey Firefly £11.50

Warpaint Special: Republic P-47 Thunderbolt £18.50

Not all titles are currently in production. Consult trade advertisements for latest availability.

HLP0029
#29 Hawker Seahawk



BRIDGETOWN H

40000029561

\$24.95